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DYESTUFF REPORTER
DEVOTED TO TEXTILE WET-PROCESSING

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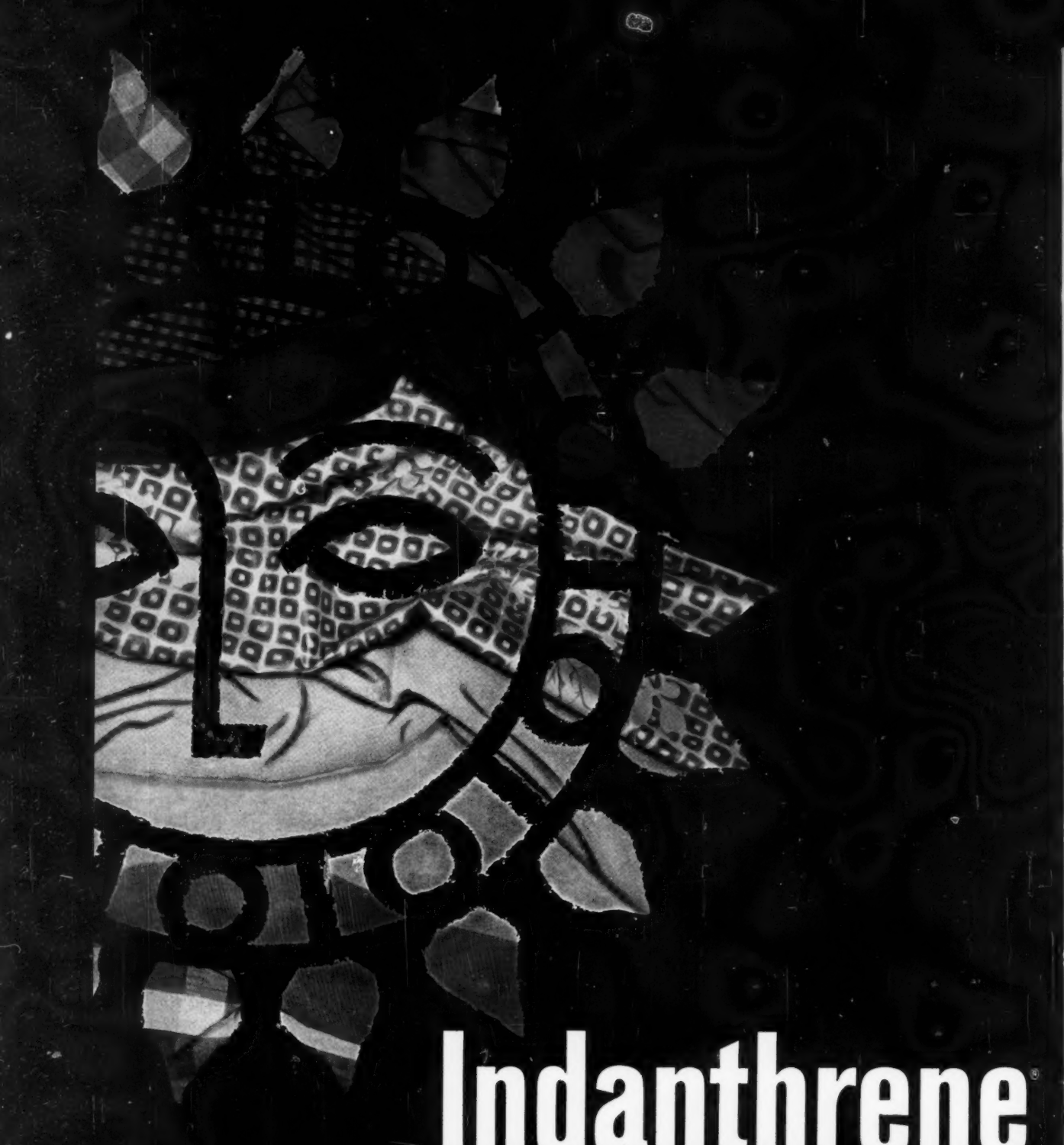

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AMERICAN

DYESTUFF REPORTER

Volume 48 February 9, 1959 Number 3

IMPROVING THE HAND OF FABRICS OF DACRON

P N LaGASSE
Textile Research Div

and

A R TAYLOR JR
Technical Service Section
Textile Fibers Dept

E I duPont de Nemours & Co, Inc

A NEW process has been developed that improves both the visual and tactile properties of fabrics of Type 54 (staple) and Type 56 (continuous filament) Dacron polyester fiber. Commonly called the C-H-C process, it improves the liveliness, drape, and covering power plus giving the fabric a drier, warmer hand than that of an untreated fabric. This process was developed for use on fabrics of 100 percent Dacron continuous filament. Subsequent work, however, prove it to be equally beneficial when applied to blend fabrics of Dacron (exclusive of blends with protein fibers).

In the C-H-C process, the fabric is calendered, heat-set, and then treated in a solution of caustic soda. The procedure as outlined here covers fabrics of 100 percent Dacron continuous filament. But, alteration of procedures in keeping with changes demanded by spun yarn fabrics will provide similar improvement in their aesthetics.

Depending on the fabric type and particular finished results desired, various types of equipment can be used to bleach and/or dye C-H-C-processed fabrics. If the fabric is processed relaxed, such as in a beck, a more subtle hand is obtained than when it is processed under tension, such as on a jig, which results in a crisper hand.

Scouring procedures vary according to the amount of soil and kind of size and oils present. Frequently, the warp yarn is sized and then heavily waxed to improve weaving efficiency. These materials must be removed completely to ensure level dyeing and to prevent yellowing during calendering and/or heat-setting.

If no wax is present, one of the usual scours for Dacron polyester fiber will suffice. After scouring, the goods should be extracted and dried in the relaxed state before calendering.

For waxed yarns the following procedure is recommended:

1) Prescour the goods at 100-120° F for 20 minutes in a bath containing:
   1.5 g/l nonionic detergent
   1.5 g/l sodium tripolyphosphate
   1.5 g/l sodium metasilicate
   0.044 g/l sodium carboxymethyl cellulose
   4.8 g/l solvent, such as xylene or Varsol.[1]
2) Make up a fresh bath containing all of the above ingredients and scour the goods at 180-200° F for 20 minutes.
3) Rinse the goods until the bath is clear.

If the solvent-emulsion scour fails to remove the wax, pad the gray goods with the straight solvent and batch the goods in a roll for one and one-half to two and one-half hours (rotate every 15 minutes) before scouring. Then scour with the above formula omitting the solvent.

Calendering has two distinct effects on fabrics of Dacron polyester fiber: 1) it flattens the yarn bundle, consequently increasing the covering power of the fabric; and 2) it reduces the thickness of the fabric, making it "light and airy." The calendering conditions used are: 10 to 20 tons pressure, 200-350° F, 15-20 ypm, one pass on each side.

Under these conditions, the fabric surface appears to be plasticized to some extent and many filaments within the yarn bundle are deformed as shown in Figure 1. This deformation produces sharp edges on the filament cross sections, which are believed to be partly responsible for the warm, dry hand of the finished fabric.

Fabrics which appear to be highly plasticized should be scoured with two percent, fortified ether-alcohol sulfate (eg, Duponol R surface-active agent) at the boil in a crab to minimize the potentiality of introducing cracks and/or wrinkles, during subsequent processing.

Fabrics containing Dacron polyester fiber should be heat-set to obtain maximum dimensional stability and to improve their wrinkle resistance. Standard methods of heatsetting can be used. The exact times and temperatures are determined by the available equipment, nature of the fabric, and the fabric end use. Hot-roll, hot-air, and radiant heat equipment can be used for heatsetting so long as the fabric itself is heated to 385-420° F for five to 30 seconds.

Figure 2 illustrates the dimensional stability of various heat set fabrics. For example, a fabric that has been heatset at 400° F will shrink approximately one percent when it is re-exposed to a temperature of 350° F.

Treatment of the calendered fabric with caustic soda solution removes the plastic-like fabric surface and stiffness which are produced during calendering, and improves the liveliness and drape.

Actually, the caustic soda dissolves some of the surface of the Dacron fiber and is accompanied by a loss in weight. The weight loss increases with increased caustic concentrations, higher temperatures, or longer exposure times, but it can be regulated and duplicated by controlling these factors closely.

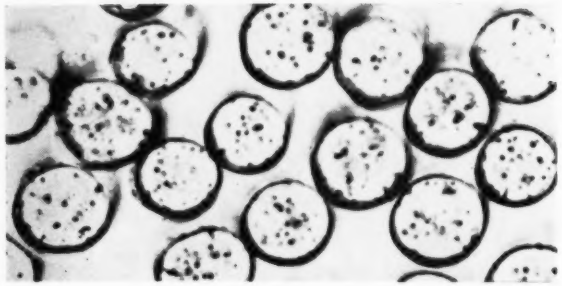
The degree of improvement in fabric properties is closely related to the weight loss obtained during caustic treatment.

Fiber strength is not affected to any great extent by the conditions prescribed (Figure 3).

A representative caustic-treating procedure is as follows:

[1]Caution: Xylene and Varsol are flammable and should be kept away from sparks and flames. Use adequate ventilation and avoid prolonged breathing of the vapors.

Commercially finished



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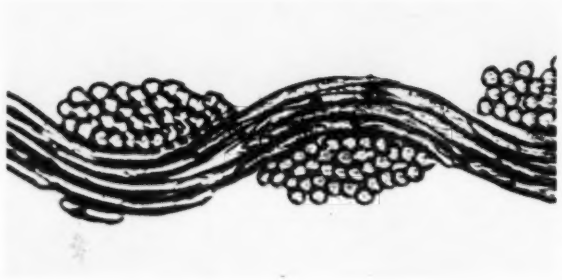

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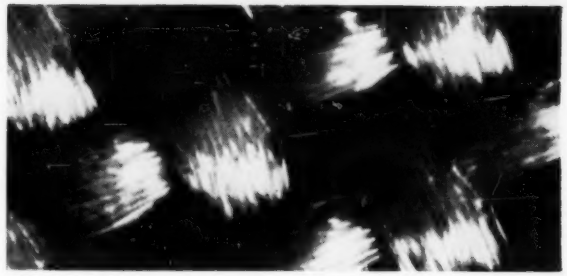
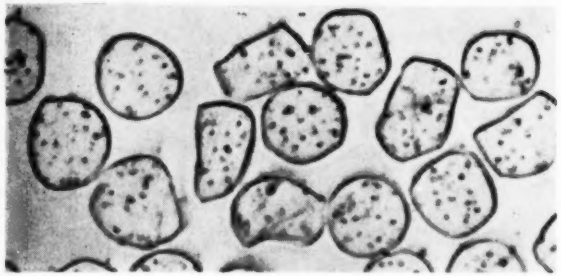


Scoured and Schreiner calendered



Scoured and Schreiner calendered

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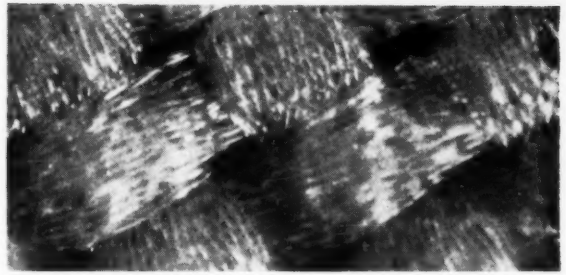

C-H-C finish

C-H-C finish

C-H-C finish

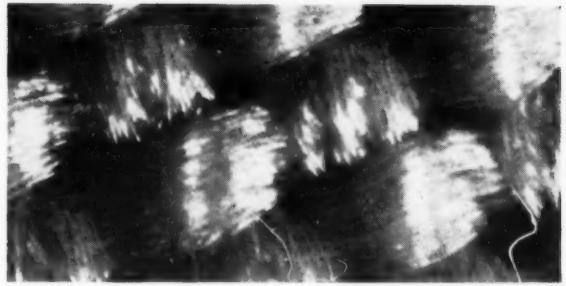

Figure 1

Figure 1

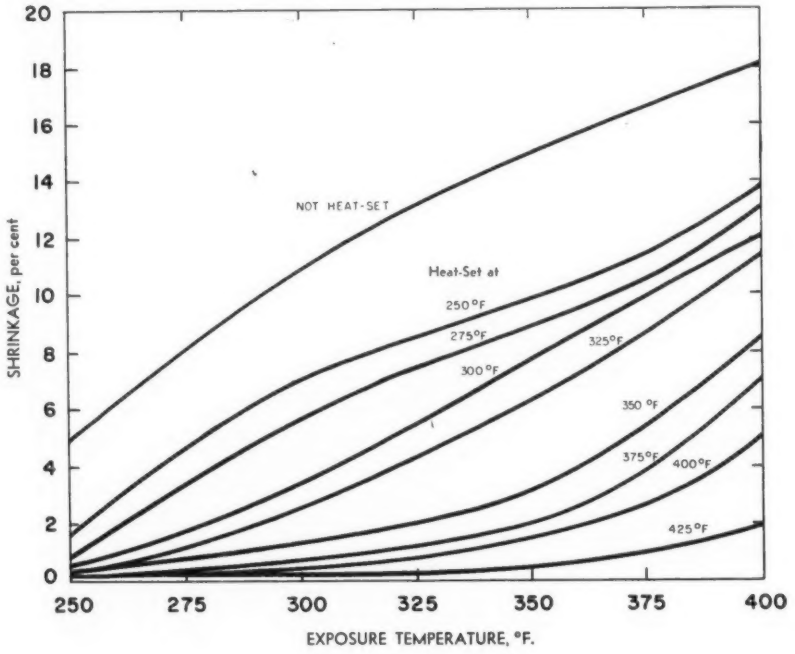

Figure 2
Effect of heatsetting temperatures on the shrinkage of Dacron during subsequent exposures in air at high temperatures

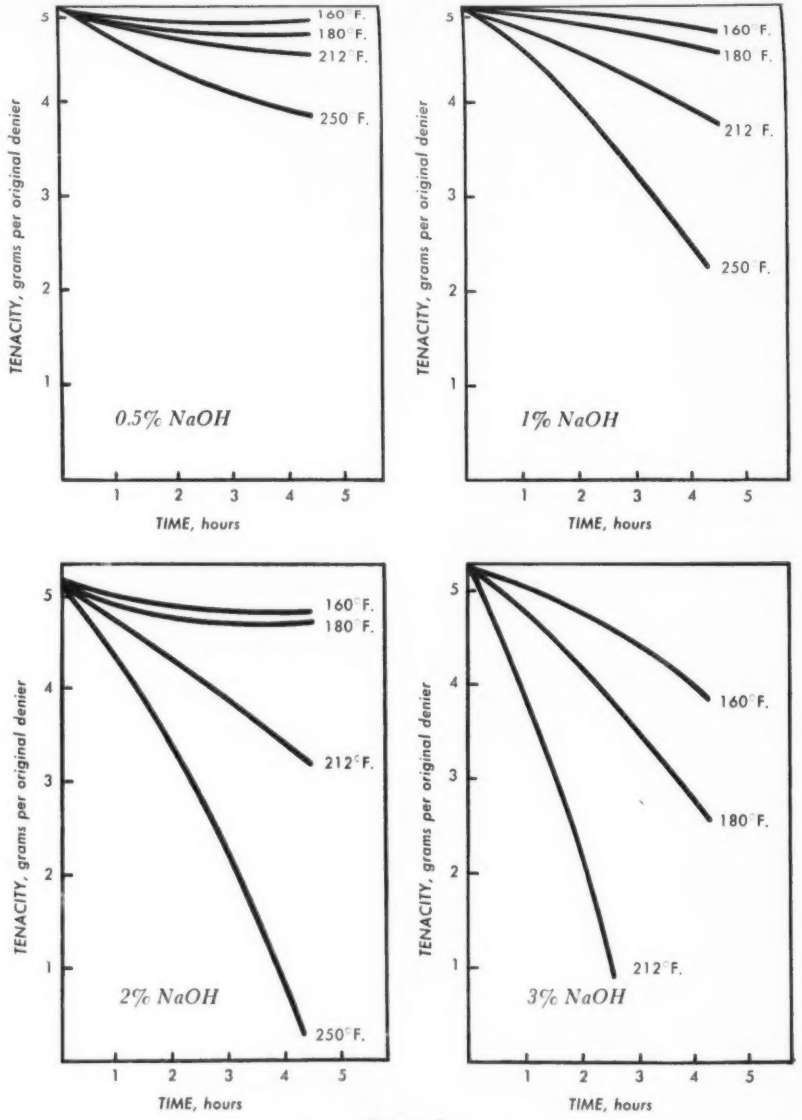

Figure 3
Breaking tenacity of Dacron after exposure to various concentrations of sodium hydroxide

1) Make up a three percent caustic soda (sodium hydroxide) solution (on the weight of the bath) and enter the fabric at room temperature.
2) Raise the temperature to 210-212° F; hold at this temperature for 30 minutes; cool to 160° F over a period of 20 minutes and drop the bath.
3) Rinse in cold water for five minutes, and drop the bath.
4) Rinse for five minutes in a bath containing two g/l glacial acetic acid.
5) Drop the bath and rinse in cold water for five minutes.

If the fabric requires bleaching, the following procedure can be used:

1) Bleach at the boil for 30 to 60 minutes in a solution containing:
   2.0 gl/l Textone[2] (sodium chlorite 75-77%)
   1.7 g/l nitric acid
2) Drop the bath and rinse the goods until the bath is clear.
3) Treat the goods with one to two percent sodium bisulfite at 160° F for 10 minutes.
4) Scour the goods at 160-180° F for 30 minutes in a solution containing:
   0.05 g/l fortified ether-alcohol sulfate (eg, Duponol RA)
   0.05 g/l tetrasodium pyrophosphate
5) Rinse and add an antistat agent if required.

[2]Caution: Textone is a vigorous oxidizing agent that can be hazardous to both personnel and equipment when improperly used. Therefore, all suggestions of the manufacturer (Olin Mathieson Chemical Corp) should be followed regarding its use.

Standard dyeing and printing procedures for fabrics of Dacron polyester fiber should be used. The choice of the disperse dyes, the dyeing equipment and the dyeing method will depend upon the desired fastness characteristics and fabric end use.

An antistatic finish may be applied to fabrics of 100 percent Dacron in the final rinse during finishing, and if conditions permit, the fabric dried on a clip frame.

After the finish has been applied and the fabric has been dried, it should be Palmered at wet width, using 35 psi steam pressure and a medium-weight blanket.

Trademarks

Dacron—E I du Pont de Nemours & Co, Inc
Varsol—Esso Standard Oil Co
Duponol—E I du Pont de Nemours & Co, Inc
Textone—Olin Mathieson Chemical Corp

Abstracts

The Diazo Reaction in Dyeing

Hadfield, H R and Liquorice, W F, *Dyer* 120, 633-4, Oct 24, 1958

The authors review the three main methods employed for applying azoic dyes to cellulosic fibers:

1) *The Classical Method.* The coupling component is applied to the fiber first, and the dye is developed by treating with a diazotized base.

2) *The "Inverse" Method.* The base is applied first, diazotized, and treated with a coupling component.

3) *The Simultaneous Method.* The base and coupling component are applied together, and the dye is produced by treatment with nitrous acid.

Method 2 is probably the one most used on acetate, and method 3 has wide application on triacetate, and also on nylon and Terylene. Azoic dyes are of great importance on Terylene, but their use is generally restricted to the production of full red, maroon, navy and black shades.

Still another method, a modification of 3, has been used on acetate. This involves the application of a diazotate or triazine with the alkali salt of the coupling component. Treatment with acid produces the diazonium salt, which combines with the coupling component.

The authors discuss the effect of developing at different temperatures and in open and sealed apparatus. The advantage of sealed vessels when developing at high temperatures is obvious, to prevent loss of nitric oxide and permit the use of smaller amounts of sodium nitrite. Stainless steel machines used for the developing operation have been found not to be seriously attacked by the acids used, even at 85°C.

The authors state that the application of azoic combinations to noncellulosic hydrophobic fibers in printing has not been successful because of the slow rate of penetration of the components into the fiber, resulting in low color yield and poor fastness.

Kodel Polyester Fiber

Churchill, R L and McNally, J G, *Can Textile J* 75, 67-8, Nov 14, 1958

Kodel polyester fiber is the latest addition to the line of synthetic fibers marketed by Eastman Chemical Products, Inc. It is supplied in staple form only at present, in 1.5, 3 and 4.5 deniers per filament in semidull luster.

The physical properties of Kodel include high tensile strength, resilience, heat resistance (it may be ironed safely up to 425°F), chemical resistance (it is unaffected by acids and alkalis normally encountered) and resistance to common solvents and cleaning agents. Its moisture absorption is about 0.2%.

Kodel can be readily dyed either alone or mixed with other fibers in a full range of bright fast colors. Eastman polyester dyes are recommended for this purpose

Fabrics containing Kodel fiber are said to have outstanding crease-retention and wrinkle-resistance. They are reported to be remarkably free from pilling tendencies when compared with other types of man-made fibers in similar constructions.

Wash-and-wear tests on garments made from properly constructed fabrics have given excellent results. This is said to be due to the fact that the high resilience and toughness of the fiber is not materially changed by being subjected to normally used washing procedures and that the fiber itself shows practically no dimensional change in hot water.

Due to its low sp gr (1.22), fabrics made from Kodel weigh less per sq yd than conventional fabrics having equivalent cover, firmness and appearance.

Copper Compounds in Dyestuff Chemistry

Menzi, K, *Ciba Rev* #128, 14-21, Sept, 1958

Three outstanding properties made copper compounds useful to early dyers and render them indispensable to modern dyestuff chemistry, viz:

1) The marked tendency of copper to form complex compounds with natural and synthetic dyes.

2) The ability of copper salts, even in small amounts, considerably to accelerate chemical reactions, oxidation processes in particular.

3) The property of divalent copper salts to act as oxidants.

(Concluded on page 99)

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DYESTUFF REPORTER

Volume 48 February 9, 1959 Number 3

37th National Convention———

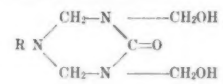
IMPARTING WRINKLE RESISTANCE TO COTTON FABRICS WITH TRIAZONE DERIVATIVES*

J DAVID REID, J G FRICK JR, ROBERT M REINHARDT and RICHARD L ARCENEAUX

Southern Regional Research Laboratory[1]
New Orleans, La

The need for a finishing agent which will give good wrinkle resistance and other improved textile properties to cotton, and which will be practically unaffected by laundering, particularly by chlorine bleaching and the highly alkaline and acid conditions encountered in commercial laundering, has led to an investigation of some "triazone" derivatives. Since compounds of this type are coming into commercial use in this country and in Europe, an evaluation of the properties is in order.

The methylol derivatives of 5-substituted tetrahydrotriazinone



have been investigated as finishing agents for imparting wrinkle resistance and "minimum-care" properties to cotton fabrics. The preparation and properties of some of these agents and the properties of the finished fabrics are described. These triazones are potentially inexpensive and may be applied to fabric by conventional procedures. The properties of the finished fabrics are compared with those of fabrics finished with some other commercial wrinkle-resistance agents and the advantages and disadvantages of each are discussed.

INTRODUCTION

EARLY work on the finishing of cotton with resin-forming monomers was directed mainly at imparting dimensional stability to the fabric. Later, this type of finish was used to produce crush or wrinkle resistance in cotton fabrics. The introduction of "wash-and-wear" garments made from synthetic thermoplastic fibers constituted a serious threat to the market for cotton and gave impetus to research to obtain improved wrinkle-resistant cotton garments (*1*). A wide range of compounds, including those used for dimensional stability, has been investigated, but only a comparatively few have been used commercially because of the rigid price limitation and fabric property requirements. Although it would seem that quality should be the prime consideration, the fact is that to date a treatment cost of about 10 cents per yard of four-oz fabric seems to be the practical ceiling for a quantity cloth item.

For wash-and-wear white cottons, an agent must give the fabric a finish which produces excellent wrinkle recovery and shape-holding properties, does not cause acid damage or yellowing as a result of hypochlorite bleaching, and is durable to laundering. The first finish to approach these requirements was achieved with the introduction of dimethylol cyclic ethyleneurea (Figure 1). This is a stable compound and marketed as a reasonably pure, inexpensive (about 50 cents per pound on a solids basis) product. Cloth treated with it has good wrinkle recovery and wash-and-wear properties. However, conflicting accounts have been published with regard to the stability of the treated cloth toward chlorine bleaching and laundering (*2-7*). The consensus seems to be that the ethyleneurea finish is resistant to home laundering, and to chlorine damage until it is degraded by acid or alkaline conditions. Acid conditions occur during the souring step of commercial laundering. Although souring should be conducted at a pH of 5 or above, many laundries actually sour at a pH as low as 3.5. At this pH, the ethyleneurea finish is not durable (*6*). The practical effect of these facts is that the ethyleneurea is not completely satisfactory for wash-and-wear white shirts which, almost inevitably, end up occasionally at the commercial laundry. It became evident that a new resin with the properties and price of dimethylol ethyleneurea, but more stable toward commercial laundering, was needed to supplant the older resin. Such properties have been approached in a new type of finish based on a class of compounds called "triazones" (*2*).

Reference to *Chemical Abstracts* shows that this type of compound was first referred to as a triazone and later as a tetrahydro triazinone. However, the trivial name of triazone seems to be firmly established in both the technical and patent literature, and this name will be used in the present paper.

Reactions for the preparation of ethyl triazone and its dimethylol derivative are shown in Figure 2. Chemically, the ethyl triazone is tetrahydro-5-ethyl-s-triazin-2-(1H)-one.

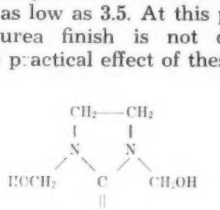


Figure 1
Dimethylol ethyleneurea (DMEU)

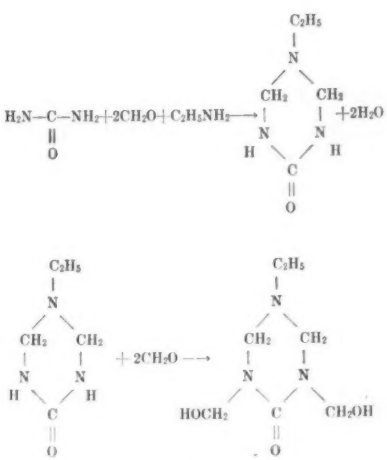


Figure 2
Preparation of ethyl triazone and dimethylol ethyl triazone (DMET)

*Presented by J David Reid on October 30, 1958 at the Conrad Hilton Hotel during the 37th National Convention.

[1]One of the laboratories of the Southern Utilization Research and Development Division, Agricultural Research Service, US Dept of Agriculture.

The first reported synthesis of a compound in the class of the triazones is that of Nencki (*8*) in 1874, who synthesized the thio compound, tetrahydro-s-triazin-2(1H)-thione, although he did not discern its structure. Subsequently, in 1933, Steindorff and Paquin (*9*) patented the 4,6-disubstituted-tetrahydro-s-triazin-2(1H)-ones. Burke, in 1942 (*10*), described a series of the compounds, substituted in the 5 position and was granted a patent on 5-hydroxyethyl-tetrahydro-s-triazin-2(1H)-one. These patent references claimed the use of the compounds as textile assistants although no methylol derivatives were mentioned. A year later, Burke (*11*) was granted a patent which described a series of alkoxymethyl derivatives of the 5-substituted triazones. Paquin, in 1948 (*12*), prepared numerous 5-substituted triazones and mentioned that methylol derivatives could be prepared from them; a German patent was obtained in 1952 (*13*). Polymers of 5-substituted triazones have since been patented as binding agents for textile finishes (*14, 15*). Only recently has mention been made in the literature of the commercial use of this type of material as a finishing agent for preparing wrinkle-resistant cotton (*2, 3*). Nuessle (*16*) states that the first triazone became commercially available in 1953, and several by 1956, but that only during 1957 did they come into general use. Recently, at the Seventh Chemical Finishing Conference, Wayland (*17*) discussed triazones as finishing agents for cotton fabrics.

It is interesting to note the acceptance or rejection of triazones by resin manufacturers. Several concerns are producing, at a price closely competitive with dimethylol ethyleneurea, what appear to be products composed primarily of triazones. On the other hand, several of the large textile-resin manufacturers apparently have not offered triazones. Aside from what seems to be a somewhat confused patent situation, it appears that the problem of odor has affected the acceptance of the triazones. Arguments against the use of the triazones include the fact that the lower primary amines can form substances with unpleasant odors, particularly in the presence of formaldehyde. It is argued that such malodorous products can be formed in the synthesis or application of the finishing agent, or in the breakdown of the finish during use. On the other hand, proponents of this class of finishing agents point out that the odor may be removed by a suitable after-

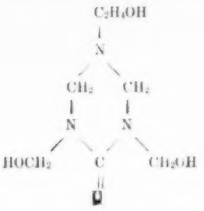


Figure 3
Dimethylol hydroxyethyl triazone (DMHET)

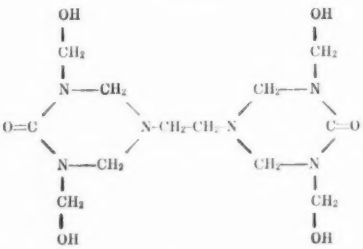


Figure 4
Tetramethylol ethylene bis triazone (TMEBT)

wash, the chlorine resistance and durability toward laundering are good, and—perhaps the most cogent argument of all—the triazones apparently have been used widely through a complete summer without undue complaint because of odor.

There is a lack of published data on the triazones. Because of this, the present paper gives details of an attempt to evaluate the triazones and compare them with other finishing agents for cotton. It is emphasized that these results should be considered as preliminary in nature. The many factors concerned which may change results, such as curing conditions, catalysts, softening agents, and so forth, are so numerous that it is impossible to consider all combinations and permutations in a paper such as this. Also, in the finishes reported, care was taken to insure an adequate cure. Comparison of our laboratory results with those obtained on commercial products indicates that seldom is a commercially finished fabric given the cure necessary to obtain optimum results. Cloth is often judged on wrinkle recovery angle specifications without thought of durability and increased susceptibility to chlorine damage. Therefore, it would be well to judge the results obtained on a comparative rather than an absolute basis.

It should be pointed out also, that the urea-formaldehyde used gave results considerably better than the usual commercial product. This was partly because the material was freshly prepared and partly because the amount of formaldehyde used was two moles per mole of urea, rather than the 1.3-1.6 generally used commercially.

For the evaluations of the triazones, the following three were prepared and examined: dimethylol ethyl triazone (DMET), shown in Figure 2; dimethylol hydroxyethyl triazone (DMHET), or dimethylol tetrahydro-5-hydroxyethyl-s-triazin-2(1H)-one, shown in Figure 3; and tetramethylol ethylene bis triazone (TMEBT), or tetramethylol ethylene-5,5′-bis[tetrahydro-s-triazin-2(1H)-one] shown in Figure 4. These were selected as typical examples of triazones containing an alkyl group and a substituted alkyl group, and a tetrafunctional triazone, prepared from amines of a commercially practical price. The triazones were purified before use to avoid extraneous effects as far as possible. Several commercial finishing agents, the compositions of which were not known, but which were believed to be triazones, were also used in this study. They are designated Resins A, B, C, and D.

MATERIALS AND METHODS

All fabric samples included in this study were prepared from desized, caustic-boiled and bleached, 80x80 white cotton print cloth, 3.2 oz/sq yd. Impregnation was accomplished by immersion of the fabric in a solution of the finishing agent containing catalyst followed by passing through pad rolls to remove excess solution. Two dips and two nips were employed with a final wet add-on of approximately 75%. Drying and curing were carried out on pin frames in an oven with circulating hot air.

Following the curing step, samples were given a process wash with approximately 0.03% of a nonionic detergent of the alkylarylpolyether alcohol type. This was carried out in an automatic home washer at 100° F using the modern fabric cycle. The cloth samples were then tumbled dry, allowed to air equilibrate, and the wash-and-smooth-dry properties judged (*18*).

Add-on of resin was approximated by direct weighing of air-equilibrated samples and judged more accurately by determination of the nitrogen content. The latter also indicated the reproducibility of the treatment.

Physical testing was performed by the standard methods of ASTM with breaking strength determined on strips raveled to 80 threads (*19a*), flex abrasion by the Stoll method

TABLE I

Properties of triazones prepared for this study

Triazone	Method used	Yield[2] (%)	Melting point (°C) observed	Melting point (°C) literature	Nitrogen content (%) observed	Nitrogen content (%) calcd
Ethyl triazone	1	14	166–7	...	32.1	32.6
	2	28	169–72	...	....	....
Hydroxyethyl triazone	1	30	155–60	158	28.2	29.0
	2	14	159–60	...	....	....
Ethylene bis triazone[1]	1	29	195(dec)	...	34.4	36.8
	2	15	195(dec)	...	....	....

[1]Water-insoluble.
[2]These yields are not necessarily indicative of conversion, as later work has shown that higher yields (approximately 50%) can be obtained using a modified procedure and by allowing the acetone-soluble product to stand for a prolonged period followed by further extraction.

TABLE II

Effect of curing conditions on properties of DMET-treated cotton fabric[1]

Curing conditions[2] Time(min)	Curing conditions[2] Temp(°C)	Add-on (%)	Wrinkle recovery angle (deg) W	Wrinkle recovery angle (deg) F	Tearing strength (gm) W	Tearing strength (gm) F
3	140	3.4	123	138	660	420
5	140	3.5	125	139	607	380
3	150	3.4	127	136	627	387
5	150	3.5	124	137	587	380
3	160	3.4	125	140	600	353
5	160	3.4	133	141	540	327
Untreated	...		77	94	1180	933

[1]Samples treated with 7.5% solution, containing 0.5% $Zn(NO_3)_2 \cdot 6H_2O$, and 0.05% acetic acid as catalyst.
[2]Samples dried 10 min at 70°C prior to curing.

(*19b*), and tearing strength by the Elmendorf method (*19d*). Wrinkle recovery angles were measured using the Monsanto Tester (*19c*). Nitrogen contents were determined by the Kjeldahl method. "Home" laundering was performed in the usual type of home automatic washer using a household detergent (Tide[2]) without added bleach. Commercial laundering was done with white shirts in a New Orleans laundry which followed approximately the procedure suggested by the American Institute of Laundering (*20*), except that souring was carried out at a pH of 3.5-3.9. In this connection if was found that the results from commercial laundering were highly variable, even with samples from the same laundry. Laundering of separate portions or identical samples at a later date showed greater removal of finishing agent, due to an unknown variable in the process, perhaps an accidental lowering of pH or increase in temperature of the souring procedure.

The damage due to retained chlorine was determined by the AATCC scorch test method (*21*). The available chlorine retained by the finished fabric was determined by a titration procedure as follows.

An air equilibrated sample of fabric weighing approximately three g was accurately weighted, cut into half-inch squares, placed in a 500-ml Erlenmeyer flask with 200 ml of distilled water, 10 ml of 0.1*N* hydrochloric acid and two g of potassium iodide. The flask was stoppered and placed on a mechanical shaker for one hr. The liberated iodine then was titrated with 0.01*N* sodium thiosulfate using starch indicator. The flask was then placed on the shaker for another 30 minutes and, if there was a redevelopment of color, the solution was titrated again. The percent available chlorine was calculated using the formula:

$$\% \text{ Available Cl} = \frac{(\text{total ml } Na_2S_2O_3 \times N\ Na_2S_2O_3) \times 0.03545}{\text{g sample}} \times 100$$

The resistance to wet soiling was estimated by the method of Mazzeno and coworkers (*22*). Moisture regain was determined by the standard ASTM method (*19e*).

The three triazones used were prepared in the pure form as described in the following section. The commercial "triazones" were obtained from industrial sources and used as recommended by the manufacturer. For comparisons, a commercial dimethylol ethyleneurea (DMEU) and a methylated methylolmelamine (MF) were used.

The urea-formaldehyde finishing agent (UF) was prepared by the reaction of two moles of formaldehyde with one mole of urea at pH 8-8.5. After standing at room temperature overnight, the solution was neutralized with 0.1*N* HCl and used immediately. This product should be essentially dimethylolurea rather than the mixture of mono- and dimethylolurea which is usually used commercially.

SYNTHESIS OF TRIAZONES

The pure triazones were prepared by methods similar to those of Burke (*10*) or Paquin (*12, 13*), as follows:

Method 1. To two moles of formaldehyde in a neutralized 35-40% solution was added one mole of primary amine, anhydrous or in aqueous solution, with stirring and cooling, at 5-15° C. (The group on the amino nitrogen forms the 5-substituent in the triazone.) To this mixture, one mole of urea in concentrated aqueous solution was added at room temperature or below. The solution formed was allowed to stand one hour or more at room temperature and then was heated two hours on the steam bath. If the triazone is water insoluble, it crystallizes on cooling. In this case, it was filtered off and recrystallized from water. For a water-soluble triazone, the solution was evaporated under vacuum. The residue was washed with acetone and recrystallized from ethanol.

Method 2. One mole of urea was dissolved in a neutralized 35-40% formaldehyde solution containing two moles of formaldehyde. This solution was allowed to stand four hours at room temperature. At 5-15°, one mole of primary amine, anhydrous or in aqueous solution, was added with stirring and cooling. The solution was then allowed to stand one hour or more at room temperature and two hours on the steam bath. The triazone was isolated as in the first method.

The yields of purified triazones obtained by these methods are listed in Table I.

PREPARATION OF METHYLOL DERIVATIVES———For this, one mole of the triazone was dissolved in neutralized formalin, containing two moles of formaldehyde for each triazone group, and sufficient water to make a 33-1/3% solution of the product. This solution was allowed to stand at least overnight before use. The methylol derivative was not isolated, but the 33-1/3% solution was diluted to the desired strength and used for treatment of fabric.

EXPERIMENTAL

SELECTION OF CONDITIONS USED———To establish a standard set of conditions for fabric treatment, a dimethylol ethyl triazone finish was applied to fabric under the various curing conditions shown in Table II,

[2]Throughout this paper, the mention of trade names and firms does not imply their endorsement by the Department of Agriculture over other similar products or firms not mentioned.

The finish was applied to fabric from a solution containing 0.5% zinc nitrate hexahydrate and 0.05% acetic acid as catalyst. Padded fabric was placed on pin frames, dried at 70° C for 10 minutes, cured under the conditions described, and given the afterwash. Curing conditions at 150° C and three minutes were selected as giving the best results without discoloration which occasionally occurred at higher temperatures.

Using the conditions mentioned, the three triazones were applied to cotton at three add-ons varying from approximately 2.4% to 5.6%, with the results given in Table III. From these results, an 8% solution was used, with the object of obtaining in the neighborhood of 4% add on. Actually, the add-on varied from about 3.6 to 4.0%.

Increasing the amount of catalyst by 50% was found to have no effect on the triazone finish.

It was recognized that commercial catalysts, carefully tailored for specific triazones, might give better results than the acidified zinc nitrate. Later, as described in a following section, a number of commercial catalysts were evaluated and found to give higher wrinkle recovery angles with slightly lower tear strengths. For purposes of this comparison, however, it was decided to use one catalyst of known composition with the prepared triazones. With the commercial triazones and the other resins used for comparisons, conditions and catalysts were selected which, in general, were recommended by the manufacturer as giving the best results.

TABLE III
Effect of add-on of prepared triazones on fabric properties[1]

Triazone	Triazone in solution (%)	Add-on (%)	Wrinkle recovery angle (deg) W	Wrinkle recovery angle (deg) F	Tearing strength (gm) W	Tearing strength (gm) F
DMET	5.0	2.4	128	129	607	340
	7.5	3.5	131	133	587	353
	10.0	5.1	136	137	567	307
DMHET	5.0	2.4	126	129	693	440
	7.5	3.8	128	135	653	353
	10.0	5.3	131	135	653	347
TMEBT	5.0	2.4	132	134	647	413
	7.5	3.8	137	139	633	327
	10.0	5.5	134	135	620	313
Untreated	....	...	77	94	1180	933

[1]Solutions contained 0.5% $Zn(NO_3)_2.6H_2O$, 0.05% acetic acid. Samples were dried 10 min at 70°C and cured three min at 150°C.

PREPARATION OF WRINKLE-RESISTANT CLOTH——Sets of six samples of 80x80 cloth, 24" x 36", were treated with each of the various finishing agents shown in the following tables. After the curing step, all samples were given a mild process wash as described previously, tumbled dry, and their smoothness or "wash-and-wear" characteristics were judged. The properties of the treated fabrics are given in Table IV. Portions of each of these fabrics were subjected to 15 home launderings, to 15 commercial launderings, and to five launderings as described in AATCC test 14-53 (23). In following sections the effect of these launderings on each of the properties of the treated fabrics is described. The five AATCC launderings are being used in industry, as a preliminary to the chlorine scorch test, to determine whether a particular finish will be durable to conditions which may be encountered during service.

ODOR OF TRIAZONE-TREATED FABRIC——Before the afterwash, many of the triazone-treated fabrics exhibited the characteristic fishy odor of secondary and tertiary amines produced from the primary amine and formaldehyde. After the nonionic detergent afterwash, this odor was not noticeable. It could be developed, however, by moistening the fabric with dilute sodium carbonate solution. The intensity of the odor developed varied with the particular triazone used, as shown in Table IV. If instead of the afterwash generally used in the study, an afterwash made alkaline with sodium carbonate or sodium perborate is used, no odor is developed until the moist alkaline samples are allowed to incubate at 40°C (104°F) for 24 hours. Under these conditions, triazone-treated fabrics would develop at least a slight odor even after the five AATCC launderings.

It is concluded that odor develop-

TABLE IV
Properties of wrinkle-resistant cotton fabrics

Finishing agent[1]	Add-on (%)	Nitrogen (%)	Wrinkle recovery angle (deg) W	Wrinkle recovery angle (deg) F	"Wash and wear" category[5]	Tearing strength (grams) W	Tearing strength (grams) F	Breaking strength (lbs) W	Breaking strength (lbs) F	Flex abrasion (cycles) W	Flex abrasion (cycles) F	Chlorine retention: Per cent available chlorine	Chlorine retention: Brk str retained %[7]	Odor[6]
DMEU	3.6[2]	1.14	136	139	4	607	313	31.2	22.9	123	80	0.05	108	none
MF	6.2[2]	2.77	131	137	4	573	347	37.5	28.6	235	184	0.10	95	none
UF	10.8[2]	3.81	151	151	5	487	227	33.8	20.7	27	24	0.20	82	none
DMHET	3.9[4]	1.19	124	133	3	667	400	34.2	28.2	463	388	0.26	95	very slight
DMET	3.6[4]	1.29	130	130	4	627	373	35.9	23.4	313	369	0.20	95	slight
TMEBT	3.7[4]	1.37	126	130	3	660	433	36.9	25.6	420	402	0.25	89	very slight
Resin A	4.2[4]	1.22	144	143	5	667	387	30.8	22.8	197	179	0.16	88	slight
Resin B	4.8[4]	1.70	135	137	5	573	327	33.3	22.0	224	183	0.22	99	strong
Resin C	4.4[4]	1.50	128	134	4	627	453	33.8	30.7	272	334	0.19	99	slight
Resin D	3.6[4]	1.12	131	133	3	640	440	38.7	28.6	384	376	0.28	71	moderate
Untreated	—	—	77	94	1	1200	867	54.4	39.8	1791	1393	0.01	98	———

[1] DMEU, dimethylol ethyleneurea; MF, methylated methylolmelamine; UF, dimethylolurea; DMHET, dimethylol hydroxyethyl triazone; DMET, dimethylol ethyl triazone; TMEBT, tetramethylol ethylene bis triazone; Resins A, B, C, D, commercial.
[2] Dried seven min at 60° C, cured three min at 160° C.
[3] Dried seven min at 60° C, cured four min at 150° C.
[4] Dried 10 min at 70° C, cured three min at 150° C.
[5] Rating—5, excellent; 4, very good; 3, good; 2, fair; 1, poor.
[6] Determined on fabric wet with 1% Na_2CO_3 at room temperature. Fabrics had been afterwashed with dilute nonionic detergent.
[7] Breaking strength retained in scorch test, AATCC Test Method 69-1952.

TABLE V
Wrinkle recoveries, wash-and-wear properties of fabrics and durability of the finish

Finish	Wrinkle recovery angle (deg, W + F)				Wash-and-wear category[1]				Nitrogen retention (% of original)		
	Original	After 15 home launderings	After 15 commercial launderings	After five AATCC launderings	Original	After 15 home launderings	After 15 commercial launderings	After five AATCC launderings	After 15 home launderings	After 15 commercial launderings	After five AATCC launderings
DMEU	275	271	271	283	4	4	3	4	95	90	86
MF	268	276	241	277	4	4	3	3	95	92	95
UF	302	290	271	290	5	5	4	3	94	76	87
DMET	260	257	230	250	4	3	3	2	95	73	83
DMHET	257	246	223	250	3	3	3	3	92	77	85
TMEBT	256	249	219	253	3	3	2	2	87	58	78
Resin A	287	261	261	268	5	4	3	4	91	84	84
Resin B	272	265	255	282	5	4	3	4	89	71	83
Resin C	262	257	253	263	4	3	4	3	88	87	88
Resin D	264	253	244	260	3	3	3	2	89	71	82
Untreated	171	172	185	188	1	1	1	1	—	—	—

[1] Categories: 5, excellent; 4, very good; 3, good; 2, fair; 1, poor.

ment is not a serious problem with the triazone finishes. Odor is not likely to be developed in normal use, if the finishing procedure includes an alkaline afterwash. Wear tests on triazone-treated shirts have confirmed this; no noticeable odor was developed when the shirts were worn in hot weather.

An added advantage of the need for a good afterwash is the fact that removal of catalyst prevents "recuring" with setting of wrinkles and the odor of formaldehyde, both of which occur in much resin-finished fabric which is sold without an afterwash.

WRINKLE RESISTANCE AND WASH-AND-WEAR PROPERTIES.——In Table V are given the wrinkle recovery angles and the wash-and-wear properties for the series of laundered fabrics. The wrinkle recovery angles serve well as a measure of wrinkle resistance, but the judgment of wash-and-wear properties is less objective. As has been pointed out, the wash-and-wear qualities of a garment depend upon several factors, such as the pattern and color of the fabric, the design of the garment, the use for which it is intended, and the personal inclinations of the user. The wash-and-wear ratings in Table V, therefore, should be considered in relation to the personal experience of the reader. Borghetty (*3*) defines the term "wash-and-wear" as applicable to a garment that will drip dry without wrinkles and can be worn without ironing, although fastidious wearers may insist on some "touch-up" ironing. This definition corresponds to category 4 in the "wash-and-wear" ratings in Table V.

From the data in Table V, it can be seen that the triazones are poorer, in general, than the other finishes with respect to wrinkle resistance and wash-and-wear properties. Some of the commercial finishes, however, are superior to the other finishes. In one of these finishes, the increased effectiveness has been found to be due to the superiority of the manufacturer's catalyst. This point will be discussed further in a following section.

Another point, to be discussed in more detail in a following section, is the use of thermoplastic polymers in conjunction with the triazone finishes. The use of these thermoplastic additives will generally raise the "wash-and-wear" ratings of a finish. Any of the triazones tested will give a finish with a "wash-and-wear" rating of 4 or 5 when combined with the thermoplastic additive.

With regard to durability, the triazones appear poorer than the melamine or ethyleneurea finish and about comparable to the urea finish. This shows most clearly in the nitrogen loss through the series of commercial launderings, the most drastic of the durability tests performed. Again, two of the commercial triazones are superior to the others. The durability of the ethyleneurea finish in these tests was due to rather careful control of the souring step in this commercial laundry. It has been shown (*6*) that excessive acidity or high temperature at this step drastically reduces the durability of the ethyleneurea finish.

RESISTANCE TO CHLORINE DAMAGE.——The principal claim to superiority made for the triazone finishes is that they are resistant to damage caused by hypochlorite bleaches before and after extended laundering. It has been pointed out by Borghetty (*2*) and by Nuessle (*16*) that this property of the triazone finishes is due to a neutralizing action in which the tertiary amine group, characteristic of the triazones, neutralizes the acids formed from the retained chlorine and prevents degradation of the fabric. The salt formed is broken up during alkaline laundering and the free amine is regenerated to repeat the cycle. Therefore, while the triazones may be chlorine retentive, they are also resistant to chlorine damage.

In Table VI are given the data obtained from the scorch test and determinations of available chlorine with the finished cotton fabrics, before and after laundering. In considering these results, it should be remembered that the scorch test is controversial. Opponents claim the test to be too severe to be realistic and that results are not reproducible. The proponents of the triazone finishes, however, have pointed out that their finishes can withstand the scorch test after five launderings by the AATCC 14-53 method, and some finishers have been buying them on this basis.

From Table VI, it can be seen that the scorch test does little damage to untreated cotton. The fabrics with finishes other than the triazones behaved as would be expected from published data concerning them. The ethyleneurea finish lost its resistance to chlorine retention after the commercial or AATCC launderings although it was little affected by home-type laundering. Frick *et al* (*24*) and Nuessle (*16*) suggest that hydrolytic cleavage of the ethyleneurea ring is the cause of the increased chlorine retention. The melamine finish caused little strength damage at any stage, but the fabric did acquire the

characteristic yellow color on bleaching. The fabric with the urea finish suffered severe strength losses on scorching after all launderings. The original high resistance to scorch damage shown by these urea-formaldehyde finishes, as compared with that shown by the usual finishes of this type, is due to the use of dimethylol urea as pointed out previously. A sample similarly treated with a urea-formaldehyde preparation containing only 1.5 molar equivalents of formaldehyde showed only 37% strength retention on the scorch test, even before laundering. Also, the sample with the higher add-on of urea-formaldehyde was observed to suffer less damage in the scorch test.

In general, the claims for the triazones with regard to the absence of chlorine damage were substantiated. Of the three prepared triazones, only the tetrafunctional compound, ethylene bis triazone, caused drastic loss of strength on scorching. One of the commercial preparations (Resin D) also caused excessive damage while the other commercial preparations caused only small strength losses. It may be concluded, then, that a triazone-finished fabric, when compared with fabric finished with ethyleneurea, will show a slightly greater tendency to be damaged by hypochlorite bleach originally, but will show much less tendency to this damage after severe laundering.

EFFECT OF FINISHES ON THE STRENGTH OF THE FABRIC——The tearing and breaking strengths of untreated control fabric and the series of treated fabrics, before and after the laundering procedures, are given in Tables VII and VIII.

In all cases the loss in tearing strength on treatment is directly related to the increase in wrinkle recovery, Table V, and is not related to the finishing agent used. The slightly higher tearing strengths obtained with most of the triazones correspond to the lower wrinkle recoveries. The value for the urea-formaldehyde finish, because of the higher add-on, is distorted relative to the other finishes.

In regard to the loss in breaking strength on finishing, as shown in Table VIII, the values roughly correlate with the tearing strength. The smaller loss with triazones and melamine, however, may be due to the basicity of these compounds minimizing acid degradation during the curing procedure. This can also be shown by comparing the tearing strengths of the fabrics after stripping the finish with a urea-phosphoric acid solution, as shown in Table IX.

TABLE VI
Chlorine retention and scorch damage of wrinkle-resistant cotton fabrics

Finishing agent	Original		After 15 home launderings		After 15 commercial launderings		After five AATCC 14-53 launderings	
	Avail chlorine (%)	Brk str retained[3] (%)	Avail chlorine (%)	Brk str retained[3] (%)	Avail chlorine (%)	Brk str retained[3] (%)	Avail chlorine (%)	Brk str retained[3] (%)
DMEU	0.05	108	0.09	93	0.14	57	0.14	50
MF[1]	—	95	—	103	—	102	—	85
UF (10% add-on)	0.20	82	0.29	54	0.52	35	0.35	46
UF[2] (4% add-on)	0.32	52	—	—	0.75	10	—	—
DMHET	0.26	95	0.20	82	0.31	84	0.24	92
DMET	0.20	95	0.13	82	0.27	88	0.19	94
TMEBT	0.25	89	0.44	54	0.62	40	0.63	41
Resin A	0.16	88	0.17	87	0.24	87	0.23	112
Resin B	0.22	99	0.30	99	0.39	86	0.38	82
Resin C	0.19	99	0.19	84	0.25	82	0.23	81
Resin D	0.28	71	0.40	44	0.32	72	0.38	53
Untreated	0.01	99	0.01	81	0.01	99	0.01	101

[1] Available chlorine is not reported because of unreliable results due to transitory end point even after the second period of shaking.
Both urea-formaldehyde agents contained two moles formaldehyde for each mole of urea.
Breaking strength retained in scorch test, AATCC Test Method 69–1952 (*21*).

TABLE VII
Effect of finishes on tearing strength

Finishing agent	Tearing strength (W + F)							
	Original fabric		After 15 home launderings		After 15 commercial launderings		After five AATCC launderings	
	(g)	(% of control)	(g)	(% of control)	(g)	(% of control)	(g)	(% of control)
DMEU	920	45	760	57	767	57	1013	53
MF	920	45	1007	76	906	68	1100	58
UF	714	35	727	55	847	63	860	45
DMET	1000	48	874	66	980	73	1146	60
DMHET	1067	52	927	70	973	73	1233	65
TMEBT	1093	53	967	73	994	74	1260	66
Resin A	1054	51	1080	81	1093	82	1114	58
Resin B	900	44	820	62	820	61	1007	53
Resin C	1080	52	934	70	873	65	1114	58
Resin D	1080	52	927	70	913	68	1154	60
Untreated	2067	100	1326	100	1340	100	1907	100

TABLE VIII
Effect of finishes on breaking strength

Finishing agent	Breaking strength (W + F)							
	Original fabric		After 15 home launderings		After 15 commercial launderings		After 5 AATCC launderings	
	(lbs)	(% of control)	(lbs)	(% of control)	(lbs)	(% of control)	(lbs)	(% of contro
DMEU	54.1	57	55.9	61	57.3	67	51.6	58
MF	66.1	70	59.7	66	65.8	77	60.8	68
UF	54.5	58	50.8	56	64.9	76	53.7	60
DMET	59.3	63	66.0	73	71.9	84	62.7	70
DMHET	62.4	66	72.7	80	73.0	85	65.2	73
TMEBT	62.5	66	72.3	80	77.5	91	70.3	79
Resin A	53.6	57	59.8	66	64.4	75	51.5	58
Resin B	55.3	59	56.1	62	64.0	75	56.9	64
Resin C	64.5	68	71.4	79	65.5	77	64.5	72
Resin D	67.3	71	68.7	76	70.2	82	67.7	76
Untreated	94.2	100	90.5	100	85.2	100	89.0	100

The stripping restores part of the strength, that due to the physical changes caused by the finish. A remaining loss in strength, as compared with the stripped control sample, is that due to acid degradation of the cotton during the treatment.

On laundering, all finished fabrics gain strength relative to the control fabric. The gain in relative strength once more appears related only to the loss in wrinkle recovery. With none of the finishes, even the urea-formaldehyde, is there any evidence of

TABLE IX
Tearing strengths of wrinkle-resistant cotton fabrics after acid stripping

Finishing agent	Tearing strength (Warp, g)	Loss of tearing strength (% of control)
Untreated	1127	—
DMEU	993	11.9
MF	1020	9.5
UF	920	12.4
DMET	1053	6.6
DMHET	1127	0.0
TMEBT	1093	3.0
Resin A	1093	3.0
Resin B	1060	6.0
Resin C	1033	8.3
Resin D	1100	2.4

damage due to the hypochlorite bleach used in the commercial laundry procedure.

HYDROLYSIS OF FINISHED FABRIC———It is known that wrinkle-resistant finishes based on nitrogenous finishing agents can be removed by treatment of the fabric with acidic solutions. Mazzeno *et al* (*6*) have shown that an ethyleneurea finish is removed on laundering if the fabric is soured below pH 3-4. Frick *et al* (*24*) have shown that alkaline washes also affect the ethyleneurea finish, causing a reduction in chlorine resistance, although wrinkle recovery remains unimpaired.

To compare the various finishes under investigation with respect to their resistance to hydrolytic removal, the finished fabrics were exposed to solutions of a range of pH for 30 minutes at 40° C. The changes undergone in wrinkle recovery and nitrogen content are shown in Table X. Loss of wrinkle recovery for three selected finishes is shown graphically in Figure 5. These data indicate that a lower pH is required to remove a triazone finish than is required for the ethyleneurea finish. Melamine and urea finishes require even a lower pH. This means that if the fabrics are submitted to an excessively acidic sour in a commercial laundry procedure, a triazone finish would be less likely to be removed than an ethyleneurea finish, although more likely than a melamine or urea finish.

To study further the stability of the finishes under hydrolytic conditions, the fabrics were submitted to pH 3.7-4.2 for 30 minutes at 40° C and to pH 11 for 60 minutes at 80° C. The nitrogen content, wrinkle recovery, and chlorine retention of the samples were tested after these treatments with the results shown in Table XI. Under these conditions, little loss of nitrogen or wrinkle re-

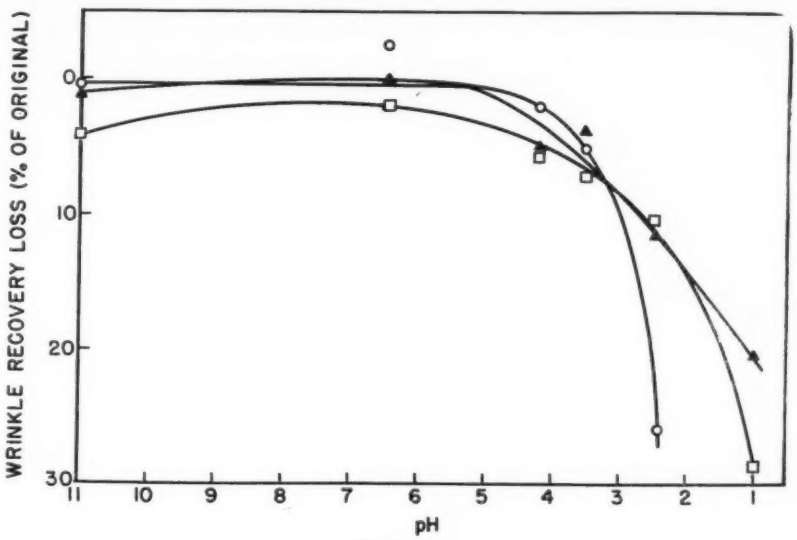


Figure 5
Loss of wrinkle resistance of treated fabrics on hydrolysis with solutions of various pH

○—DMEU ▲—DMET □—Resin B

TABLE X
Effect of pH on hydrolysis of wrinkle-resistant cotton fabrics[1]

	Resin % add-on	DM-EU 3.6	MF 6.1	UF 10.8	DMH-ET 3.8	DM-ET 3.6	TME-BT 3.6	A 4.2	B 4.9	C 4.3	D 3.5
—[2]	WRA[3]	276	268	303	260	262	268	278	282	271	253
pH 1.0	WRA	—	246	266	181	208	186	210	201	216	184
	N[4] (%)	—	97	70	8	25	16	28	14	33	12
pH 2.4	WRA	204	256	297	222	231	247	256	253	254	219
	N (%)	47	101	92	75	79	87	86	87	80	73
pH 3.5	WRA	262	265	293	236	252	240	270	262	265	254
	N (%)	92	103	96	96	96	94	93	98	100	96
pH 4.2	WRA	270	268	294	252	249	258	269	267	264	246
	N (%)	96	105	95	96	95	98	98	99	100	97
pH 6.4	WRA	283	275	298	266	262	271	279	276	269	254
	N (%)	98	101	96	97	98	98	98	99	98	97
pH 11.0	WRA	275	276	292	254	259	271	272	270	258	253
	N (%)	96	102	96	99	99	102	98	100	100	97
pH 14.0	WRA	279	—	—	261	262	274	277	270	274	253
	N (%)	102	—	—	104	103	100	99	102	108	102

[1] Hydrolyzed at indicated pH for 30 min at 40° C.
[2] Resin-treated control.
[3] Wrinkle recovery angle — warp + fill.
[4] Percent of original nitrogen.

TABLE XI
Properties of wrinkle-resistant cotton fabrics after acid and alkaline hydrolysis

Finishing agent	Initial wrinkle recovery angle (deg, W + F)	Alkaline hydrolysis[1]				Acid hydrolysis[2]			
		Nitrogen retained (% of original)	Wrinkle recovery angle (deg, W + F)	Chlorine retention		Nitrogen retained (% of original)	Wrinkle recovery angle (deg, W + F)	Chlorine retention	
				Avail chlorine (%)	Brk str retained (%)[4]			Avail chlorine (%)	Brk str retained (%)[4]
DMEU	276	100	278	0.12	68	100	272	0.09	76
MF[3]	268	100	265	—	104	97	276	—	88
UF	303	86	281	0.36	46	94	301	0.22	78
DMHET	260	96	249	0.31	87	94	265	0.30	90
DMET	262	100	255	0.17	81	100	258	0.19	89
TMEBT	268	95	248	0.24	88	92	257	0.33	88
A	278	93	273	0.16	85	94	268	0.16	87
B	282	86	264	0.32	106	99	272	0.32	86
C	271	99	262	0.18	90	93	261	0.22	92
D	253	88	252	0.21	65	100	250	0.37	56

[1] Hydrolysis performed in 1.0% Na_2CO_3 (pH 11.0) at 80° C for one hour.
[2] Hydrolysis performed in buffered solution (pH 3.7–4.2) at 40° C for 30 minutes.
[3] Available chlorine is not reported because of unreliable results due to a transitory end point even after the second period of shaking.
[4] Breaking strength retained in scorch test, AATCC Method 69–1952 (*21*).

TABLE XII
Moisture regain of wrinkle-resistant cotton fabrics

Finishing agent	*Add-on (%)*	*Moisture regain (%)*	*Wrinkle recovery angle (W + F)*
Untreated	—	6.47	171
DMHET	3.7	5.59	257
TMEBT	3.9	5.56	256
DMET	3.6	5.48	260
Resin D	3.6	5.43	264
Resin A	4.2	5.37	287
Resin C	4.4	5.33	262
MF	6.2	5.28	268
Resin B	4.8	5.09	272
DMEU	3.6	4.90	275
UF	10.8	3.95	302

TABLE XIII
Comparison of catalysts for triazones

Triazone	*Catalyst*	*Add-on (%)*	*Wrinkle recovery angle (W + F)*	*Tearing strength (W + F, grams)*
Dimethylol ethyl triazone	Zinc nitrate with acetic acid	3.6	260	1000
Dimethylol ethyl triazone	"Catalyst B"	4.2	284	873
Dimethylol ethyl triazone	Alkanolamine hydrochloride	3.9	269	980
Resin B	"Catalyst B"	5.0	272	900
Resin B	Zinc nitrate with acetic acid	4.1	240	1040

TABLE XIV
Effect of polyethylene additive to triazone resin finish

Triazone	*No additive*		*1.5% Polyethylene additive*	
	Wrinkle recovery (W + F)	*Tearing strength (warp, grams)*	*Wrinkle recovery (W + F)*	*Tearing strength (warp, grams)*
Resin B	272	573	294	620
Dimethylol hydroxy ethyl triazone	265	640	285	733
Tetramethylol ethylene bis triazone	259	640	282	793

covery occurs with any of the finishes. There are noticeable increases, however, in the damage that occurs in the scorch test. Under the alkaline conditions, urea, ethyleneurea, and one commercial triazone—Resin D—show marked increase in scorch damage. This triazone, however, was the one that was poor in this respect initially. Under the acidic conditions, all finishes show an increase in scorch damage, which, however, is less for the triazone type, except for the same commercial Resin D. This increased susceptibility to chlorine damage can be produced even though little or no damage to wrinkle recovery occurs. It is, therefore, hidden and may not appear as fabric damage for a considerable period. In general, it may be said that triazones are less susceptible to this hidden hydrolytic damake than are the other finishes.

MOISTURE REGAIN VERSUS WRINKLE RECOVERY ANGLE ———The moisture regain of the resin-treated cotton samples studied is inversely related to the wrinkle recovery angle. A number of samples are listed in Table XII, and it may be seen that there is a good correlation between these properties. Different substituents on the triazone ring make no apparent difference, even when as polar as the hydroxyethyl group.

WET SOILING OF COTTONS ———Wet soiling tendencies of the treated cottons were determined by a method previously described (*22*). The soiling properties of the treated cottons showed no significant changes from that of untreated cotton.

ROT RESISTANCE ——— The triazones show similar resistance to rotting as other crosslinking finishing agents. When the finished samples were exposed to the soil burial test (*25*), in which untreated cotton rotted in five days, the treated samples were in good condition after five weeks.

CATALYSTS———As mentioned earlier, it was known that some commercial catalysts were more efficient than zinc nitrate containing a small amount of acetic acid, but a catalyst of known composition was preferred for the present work. In Table XIII is shown a comparison of some catalysts. "Catalyst B" is the catalyst recommended by the manufacturer of Resin B. The commercial catalyst is more efficient as indicated by the higher add-on of resin and increased wrinkle recovery obtained under strictly comparable conditions. As usual, tearing strength decreases as the wrinkle recovery angle increases.

EFFECT OF THERMOPLASTIC ADDITIVES———Thermoplastic additives, such as acrylates, silicones, and polyethylenes are used with resin finishing agents to improve hand, wrinkle resistance, and tearing strength. Such additives were not used in the work detailed above, (except for those commercial products which contained them already) because it was preferred not to complicate the results with this added factor. The addition of thermoplastic materials, however, improves the triazone finishes as has been observed with other finishes (*26*). In Table XIV are shown the improvements obtained when emulsified polyethylene is added to the treating bath.

MIXTURES OF RESIN-FINISHING AGENTS———Consideration of the methods of synthesis of the triazones indicates that it is probable that commercial triazones, which are not, of course, purified by crystallization, really contain mixtures of the triazone with urea-formaldehyde and, perhaps, other byproducts of the reaction. The presence of some urea-formaldehyde in the triazone solution should not be serious. In most respects, urea-formaldehyde is an excellent crease-resistance agent. Furthermore, the neutralizing action of the triazone toward acids formed from retained chlorine should protect the cloth against the chlorine retained by a considerable amount of urea-formaldehyde. Preliminary experiments confirmed the fact that the triazones exert such protective action. For example, a cloth finished with dimethylol ethyl triazone lost 5% strength in the scorch test, and one with urea-formaldehyde lost 48%. Cloth finished with an equimolar mixture of the two lost only 3%. Such a protective action on chlorine retentive finishes has been noted with melamines (*27, 28*). Further study of this type of protective finish is being made.

It should not be concluded from the preceding, however, that the amount of triazone in the preparation is unimportant. Experiments reported in the following section with a prepared but not purified triazone show that proper preparation is necessary if the pure triazone is not isolated.

EFFECT OF AGING ON TRIAZONES———Preparations of the three purified dimethylol triazones were allowed to age for two months and then applied to cotton fabric. Comparison of the results obtained with those obtained from the newly

prepared materials showed little difference, except with TMEBT, which showed marked improvements.

To determine the effects of aging on the unpurified material, a preparation of unpurified dimethylol ethyl triazone was applied using the zinc nitrate-acetic acid catalyst. This unpurified product was prepared by method 2, described previously, but without isolation of the pure triazone. Assuming 100% conversion to ethyl triazone, the calculated amount of formaldehyde was added to form the dimethylol derivative. The wrinkle recovery obtained with this product was considerably poorer than that obtained with the purified triazone. After aging this mixture for two months, however, the wrinkle recovery obtained was about the same as obtained with the purified triazone.

It is fortunate for considerations of practical use that the effect of aging, where it exists, is beneficial.

DISCUSSION AND SUMMARY

In considering the data obtained in this evaluation of the triazones, it should be remembered that results are subject to many limitations, such as the fact that finishing on a laboratory scale may not give results closely comparable to commercial scale, and that data from laundering and testing is subject to considerable variation among operators.

However, much pertinent information has been obtained. First, it appears that the prejudice against some triazones because of their fish-like odor is unjustified from the consumer's standpoint provided a thorough alkaline afterwash is given to the finished goods. The finish does not develop odor due to instability during use and, more important, a number of treated shirts have shown no odor under actual severe use conditions. It is true that this forced afterwash adds to the cost of the goods but it is probable that the small added cost is compensated for many times by the improvement in the product to the consumer due to removal of catalyst and byproducts which otherwise would contribute to formaldehyde odors, setting of wrinkles, recuring and other evils.

With regard to textile properties, the triazone finishes appear to be very similar to other good crease-resistance finishes. That is, the wash-and-wear qualities are good when properly selected and prepared triazones are applied correctly with thermoplastic additives. Moisture regain and wet soiling tendencies do not differ from other similar finishes. Loss in tearing and breaking strength appears to be an inevitable accompaniment to crosslinkage and the triazones are closely comparable to other crosslinking resins in their reduction of strength. There are indications that the basicity of the tertiary amine group may have had a small protective effect against the degradative action of the acid catalyst.

This neutralizing action also seems to be the basis of the good resistance of the finish to degradation by chlorine. Although chlorine is retained after bleaching with hypochlorite, even more than with some other finishes, the acid formed during ironing is neutralized and the base regenerated for another cycle during alkaline laundering. The protective action is well-illustrated by comparison of the high acid degradation which occurs with a urea-formaldehyde finish contrasted with the small damage which occurs when an equimolar mixture of the urea-formaldehyde and triazone is used.

The three purified materials used in this study were selected for variety and the possibility of commercial use because of low cost of the amines used. The selection was fortunate in that a considerable range of properties was obtained. The ethyl triazone gave the best results and the hydroxyethyl triazone also gave fairly good results. The triazone prepared from ethylene diamine, on the other hand, gave poor results in many respects. Probably, utilization of all four active groups in crosslinking did not occur and the fixed but active amido groups served to pick up chlorine which resulted in a poor finish.

The choice of the four commercial triazone resins was also fortuitous in that, once again, a range of properties was obtained. It was considered likely that this range was due mainly to variation in the composition of the resin—different amines, proportions of constituents—difference in catalysts, aging of the solution and so forth. Although, in the present work, a complete study to obtain maximum conversion to triazone was not made, in one preparation of ethyl triazone a 50% yield was obtained. Probably, the amount of methylolurea present in the commercial triazone preparations has considerable influence upon the properties of the finish. However, as pointed out above, a reasonable proportion of dimethylolurea is not harmful. Indeed, wrinkle recovery angles and wash-and-wear properties are improved by the presence of this resin because of its excellent crosslinking action. However, excess urea-formaldehyde will cause the resin finish to degrade due to laundering and bleaching. In considering the properties obtained with cloth treated with urea-formaldehyde, it should be remembered that dimethylolurea with a ratio of two moles of formaldehyde for one of urea was used. This finish is much more resistant to chlorine damage, and apparently to laundering in general, than the commercial product which is usually a mixture of mono and dimethylolurea with a formaldehyde to urea ratio of 1.3-1.6.

Another advantageous property of the triazone finishes is improved resistance to removal by acid as compared with ethyleneurea finishes. The triazones require about one pH unit lower for the same amount of removal under otherwise similar conditions. From the viewpoint of the finisher of resin-treated goods, as well as the customer, it is unfortunate that many commercial laundries customarily sour at a pH as low as 3.5. Nevertheless, this is the condition which prevails, and wash-and-wear goods must be finished accordingly unless the custom can be changed. Even the triazones are not resistant to some commercial launderings. Use of very acid souring agents, such as hydrofluoric acid, an extra amount of a silico-fluoride, or an accidental rise in the temperature of souring are all sufficient to remove a large proportion of the resin.

With both acid and alkaline conditions, even though little loss of nitrogen or wrinkle recovery may be detected, there appears to be a certain amount of hidden damage which appears mainly in the scorch test. Since the triazones are more resistant to chlorine damage, they are less affected by the hydrolytic process.

The triazones have the desirable features of other wrinkle-resistance and wash-and-wear finishing agents, although, in some cases, to a lesser degree. In addition they show advantages for the treatment of white cotton goods. The type of research which produced the triazones will undoubtedly continue to produce improved finishing agents which are still closer to the ideal finishing agent for cotton.

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A "WELCOME TO WASHINGTON" FROM THE '59 CONVENTION CHAIRMEN

LEONARD SMITH

NELSON F GETCHELL

ALL signs point to the October 1959 annual meeting as the biggest AATCC Convention in the history of the Association. A prime factor is the Convention's "capital" location, in Washington, mid-way between the Northern and Southern industries, with easy accessibility to every part of the country and unexcelled convention facilities.

With the prospect of a record attendance, the working committees are extending every effort to provide the very best in program, exhibits, and entertainment. Although no basic convention theme has yet been adopted, the watch word is "something for everyone."

The technical program, which will include names of outstanding personalities in textile research and development, will have papers of fundamental significance, papers dealing with practical applications of textile science, and papers relating to new equipment and processes for finishing textiles. The Convention program has been designed to complement that of the Chemical Finishing Conference of the National Cotton Council, to be held October 7. Together they will present a full picture of the latest developments in "wash-and-wear."

The anticipated record attendance, together with the fact that no commercial exhibits were held at the 1958 Meeting, promise an unusually full and interesting group of exhibits.

There will be something for everyone, entertainment-wise, too. The Entertainment Committee is arranging exceptional entertainment to follow the Friday night banquet. For the ladies, there will be tours of beautiful and historic Washington and its environs, rich in tradition and significance to Americans. Additional tours will be provided over the weekend for those who prefer sightseeing to the other entertainment features. For football fans, the University of Maryland will play Wake Forest at nearby College Park (on Saturday, October 10) and a block of seats will be held for AATCC members. For those who like football at the "graduate level," the Washington Redskins will play a home game on Sunday, October 11. Also on Saturday will be a golf tournament at the University of Maryland, which offers one of the most beautiful and challenging courses in the East. For those who want to play in the tournament and attend the football game, it will be possible to have an early golf starting time, then walk to the football stadium, just minutes away, for the game.

Your committee is proud to welcome you to Washington, and we are going all out to make this the most worthwhile and memorable Convention possible.

LEONARD SMITH, *General Chairman*
NELSON F GETCHELL, *Deputy Chairman*

37th National Convention———

EVALUATION OF THE EFFECTIVENESS OF ANTIBACTERIAL FINISHES FOR CLOTH*

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The antibacterial activity imparted to cotton cloth by treatment with varying concentrations of phenyl mercuric acetate, benzalkonium chloride, or trichlorocarbanilide (TCC) was determined by a method which closely parallels actual use conditions. The method is based on the determination of titratable acid or alkali produced by the growth of the test organism in a highly buffered medium containing urea or glucose and held in the interstices of the test fabrics.

Growth of *S. aureus* was entirely inhibited by cloth treated with 2.5 ppm PMA, 20 ppm TCC or 62.5 ppm benzalkonium chloride. Similar values with *B. ammoniagenes* were 2.5 ppm PMA, 20 ppm TCC or 125 ppm benzalkonium chloride. Growth of *E. Coli* and *P. mirabilis* was inhibited by cloth treated with 500 ppm benzalkonium chloride, or 10 ppm PMA. Cloth samples treated with solutions containing up to 40 ppm TCC did not inhibit growth of *E. coli* or *P. mirabilis*.

INTRODUCTION

IN recent years there has been much work done on the development of processes which impart antibacterial and antifungal properties to cloth or paper. The effectiveness of such treatment is reflected in the ability of the treated material to prevent growth of microorganisms in the treated material itself. In the process of evaluating a treatment for diapers it became obvious to us that no method closely parallelling use application was available. The ideal test should be one by which the ability of the cloth to inhibit bacterial growth in the interstices of the fibers of the test material could be determined.

The most widely used test at present probably is the agar plate, zone of inhibition test. In this method swatches of the test cloth are placed on the surface of inoculated agar. After proper incubation, the effectiveness of the cloth is judged by the presence or absence of zones of inhibition of growth surrounding the test swatches. These zones of inhibition are present only when the cloth swatches contain some bacteriostatic substance which diffuses from the cloth sufficiently to cause bacteriostasis in the surrounding medium.

A second method of evaluating fabrics is that of Latlief & Associates (*1*). This method is based on the inhibition of ammonia formation by *Proteus mirabilis* from a buffered urea medium when the treated fabric is placed in inoculated broth in a ratio of approximately one gram of cloth to ten milliliters of broth. Ammonia formation is shown by an acid-base indicator which is present in the medium. Though the ratio of cloth to medium is relatively high, there is much free liquid present, approximately 50% of the media volume in the case of diapers, and only fabric samples containing a diffusible bacteriostatic agent will appear satisfactory. In addition the method is only semiquantitative, the degree of effectiveness being judged by the length of time required for the production of sufficient ammonia to change the color of the indicator.

The disadvantages of the above test procedures are to a large degree overcome in a procedure which we have been using in routine testing.

The procedure was developed initially as a measure of bacteriostatic properties imparted to diapers when treated with two diaper sanitizing market preparations containing quaternary ammonium salts and several experimental formulations containing the sodium salt of o-benzyl-p-chlorophenol. It has since been modified and used in the evaluation of a large number of experimentally treated cloth samples.

EXPERIMENTAL

In all tests, swatches 1½" x 2½" were cut from experimentally treated diapers, and placed in wide-mouth two-ounce jars. A sufficient number should be used in each jar so that three milliliters of media will saturate all of the fabric sample and no free liquid will be present. Two double thicknesses of gauze type diapers or two single thicknesses of "Birds eye" type are required. These values will naturally vary with the absorbency of the test fabric. The bottles containing the swatches should be loosely capped and sterilized by autoclaving.

Three milliliters of medium inoculated with the test organism were added and distributed evenly over the cloth, and the bottles were capped and incubated, 18-24 hours at 35°C.

The inocula were prepared by washing the organisms obtained from 24-hour nutrient broth cultures with two portions of sterile water buffered at a pH of 7.2 with $\frac{M}{3200}$ phosphate buffer.

Bacterial growth in the medium absorbed by the treated fabric was estimated after incubation by washing the contents of the bottle including the swatch into a beaker with two 20-milliliter portions of distilled water and titrating the acid or alkali produced from the medium.

In the initial development of the test, normal human urine enriched by the addition of one percent peptone was used as the test medium. The test organism used was *Brevibacterium ammoniagenes*. This organism produces rather large amounts of ammonia from urea, which is present in normal urine, and is probably one of the organisms causing ammonia dermatitis (diaper rash) in infants (*2*).

In these early tests the incubated samples were evaluated on the basis of ammonia odor only. This differentiated between samples exerting complete bacteriostatic action and those partially bacteriostatic or not bacteriostatic. In an effort to evaluate the samples quantitatively, the swatch was washed into a beaker and the pH, relative strength of ammonia odor, and titratable alkalinity of the solution, were determined. There was good correlation between the final pH, the strength of the ammonia odor and the volume of standard acid required to reduce the pH of the solution to the original pH of the medium; however, titration proved to be the most precise method of evaluation. Controls with uninoculated medium were prepared from each sample, and positive controls were pre-

*Presented October 31, 1958 at the Conrad Hilton Hotel, Chicago, Ill during the 37th National Convention.

TABLE I
Tests with *Brevibacterium ammoniagenes* using urine peptone medium

Treatment	Swatch titration tests: Inoculated pH	Inoculated Ml N/50 HCl	Uninoculated pH	Uninoculated Ml N/50 HCl	Agar plate zone of inhibition[4]
BCP[1]	7.7	9.8	7.5	1.3	0
BCP[1]	7.6	4.2	7.4	1.3	0
BCP[1]	8.6	25.6	7.5	1.4	0
Quat[3]	8.7	25.0	8.0	4.6	5
None	8.7	29.1	7.3	1.0	0

[1]Diapers were treated with an experimental diaper sanitizer. Active ingredient 100 ppm sodium o-benzyl-p-chlorophenate in treating solution.
[2]Diapers were treated with an experimental sanitizing solution containing 50 ppm sodium o-benzyl-p-chlorophenate.
[3]Diapers were treated with the recommended use dilution of a commercial diaper sanitizer containing p-di-isobutyl-phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride.
[4]Zone width in mm. 0 = No inhibition.

TABLE II
Tests with urealytic organisms using buffered urea medium

Test organism	Cloth treatment: Compound	Conc ppm	Swatch titration test: pH	Ml of N/50 HCl	Agar plate zone of inhibition[4]
Proteus mirabilis	Quat[1]	1000	7.2	4.2	P
		500	7.3	5.4	0
		250	8.9	39.8	0
		125	8.9	39.9	0
	PMA[2]	10	7.2	2.6	0
		5	8.4	15.7	0
		2.5	8.9	39.7	0
	TCC[3]	40	8.9	32.0	0
		20	8.9	45.0	0
	None	—	8.9	48.6	0
Brevibacterium ammoniagenes	Quat[1]	500	7.2	2.9	8
		250	7.2	2.8	9
		125	7.3	3.5	7
		62.5	8.0	17.3	6
	PMA[2]	5.0	7.2	2.8	2
		2.5	7.2	2.9	2
		1.25	8.0	16.8	2
	TCC[3]	20	7.3	2.9	1
		10	7.6	6.2	P
		5	7.7	8.0	0
		2.5	8.5	16.0	0
		1.25	8.8	38.0	0
	None	—	8.9	37.0	0
Uninoculated Controls	Quat	1000	7.2	3.0	
	PMA	40	7.2	3.1	
	TCC	40	7.25	3.2	
	None	—	7.2	3.0	

[1]Benzalkonium chloride concentration of treating solution.
[2]Phenyl mercuric acetate concentration of treating solution.
[3]Trichlorocarbanilide concentration of treating solution.
[4]Zones width in mm. P = Partial inhibition under swatch, O = No inhibition under swatch.

pared with inoculated medium and untreated fabric samples for each test.

Though the test as outlined above proved very valuable in evaluating treated samples, there was a considerable variation in the maximum titratable alkalinity and final pH in tests from day to day. It was thought that these variations were due to variation in the urea content and buffering capacity of various lots of urine. A highly buffered medium of definite composition was developed. In tests with this medium much more uniform values have been obtained with untreated control samples. The values obtained are fairly uniform from day to day.

The composition of the medium which has proven to be the most satisfactory of the several tried is somewhat similar to the urease medium of Rustigan and Stuart (3) but has considerably more buffer capacity.

Basal Medium:
5.0 g NaCl
5.0 g beef extract
10.0 g neptone (BBL Thiotone)
17.4 g Na_2HPO_4
7.6 g KH_2PO_4
Distilled water qs to 900 milliliters
Urea solution—
25 g urea, dissolved in distilled water qs to 100 milliliters.

The ingredients of the basal medium were dissolved by heat and the pH adjusted to 6.8, and made up to volume after filtration. The medium was distributed in 90-ml amounts in 150-ml French square bottles and autoclaved at 15 lbs pressure for 20 minutes.

The urea solution was sterilized by filtration.

For the complete medium 10 milliliters of the urea solution were added to each 90-milliliters portion of the basal medium.

The urea medium has proven satisfactory for tests with two urealytic organisms, *B. ammoniagenes* and *P. mirabilis.*

A slight modification of the test was necessary in tests with *P. mirabilis,* a very actively urealytic organism. In order to demonstrate maximum ammonia formation by this organism it is necessary to neutralize some of the ammonia as it is liberated from the test fabric. This was achieved by placing each of the two-ounce bottles prepared with the inoculated test swatches in the usual manner in a larger jar containing 25 milliliters of N/50 HCl. The outer jar was tightly capped and the inner jar left uncapped. After incubation for 18-24 hours at 35°C, each jar was inverted so that the dilute acid in the outer jar mixed with the contents of the inner jar. The contents of both jars, including the swatch, were washed into a beaker with two twenty-milliliter portions of distilled water. The pH of the beaker contents was determined and titration to pH 7.0 carried out with N/50 NaOH or N/50 HCl.

With this procedure, fabrics inhibiting growth would require approximatelv 25 milliliters of N/50 NaOH to adjust the test solutions to pH 7.0. Those showing no bacteriostatic activity would require additional acid, the ammonia formed having neutralized the acid present in the outer jar and the excess accumulating in the liquids present in the test vessels.

By far the greater part of our work has been with *B. ammoniagenes* using the described urea medium. In these tests we have consistently obtained reproducible results showing good correlation between the amount of titratable alkalinity and the concentrations of treating solutions.

Recently we have carried out a limited number of tests with other inocula. The test has proven satisfactory in tests with *Escherichia coli* and *Staphylococcus aureus.* For these tests the test medium was modified by replacing the urea solution with ten milliliters of 20% glucose for each 90 milliliters of basal medium.

In tests with *S. aureus* the acid produced in untreated control samples required about 28 milliliters of N/100 NaOH to adjust the pH to that of uninoculated control samples. Partial inhibition by treated cloth samples gave intermediate values correlated with the fabric treatment. In tests with highly bacteriostatic samples there was no change from the uninoculated control samples. The values obtained with *E. coli* were about 50 milliliters of N/100 NaOH with untreated samples.

Tests which are not dependent on acid or alkali formation can be run with almost any desirable culture medium inoculum, the degree of effectiveness being estimated by tur-

bidity determinations on suspensions washed from the fabric in a standard manner. This phase of work is in a rather early stage, but it appears that good correlation between the titration procedure and turbidimetric determinations will be obtained.

A few typical tests are shown in Tables I, II, and III. The results of the AATCC agar plate zone of inhibition test are also shown.

SUMMARY

A simple test for the evaluation of the effectiveness of antibacterial finishes is described. The method more closely parallels actual use conditions than do those presently used. The growth of test organisms in media confined to the interstices of the test fabrics is determined by titrating the acid or alkali produced by the organism from a highly buffered medium.

LITERATURE CITED

(1) Latlief et al, *J Pediatrics* **39**, No. 6 (Dec 1951).
(2) Stevens, Cook, and Heberling, *ibid* **40**, No. 6, 750-6 (June 1952).
(3) Rustigan and Stuart, *J Bact* **49**, 437, 1945.

TABLE III
Tests with acid-producing organisms using buffered glucose medium

Test organism	Cloth treatment: Compound	Cloth treatment: Conc ppm	Swatch titration test: pH	Swatch titration test: Ml of N/100 NaOH	Agar plate zone of inhibition[4]
Staphylococcus aureus	Quat[1]	250	7.1	0	4
		125	7.1	0	2
		62.5	7.0	2.7	P
		31.25	6.6	12.4	0
	PMA[2]	5.0	7.1	0	1
		2.5	7.1	0	C
		1.25	6.2	16.9	C
		.625	6.2	16.8	P
	TCC[3]	20	7.1	0	1
		10	6.9	6.1	1
		5	6.9	7.1	P
		2.5	6.7	10.2	0
		1.25	6.2	17.4	0
	None	—	6.2	16.6	0
Escherichia Coli	Quat[1]	500	7.1	0	6
		250	5.5	23.5	5
		125	5.4	25.6	4
	PMA[2]	10	7.1	0	0
		5.0	5.8	18.6	0
		2.5	5.4	24.0	0
	TCC[3]	40	5.6	23.8	0
		20	5.4	25.2	0
	None	—	5.4	23.0	0
Uninoculated Controls	Quat	1000	7.1	0	
	PMA	40	7.1	0	
	TCC	40	7.1	0	
	None	—	7.1	0	

[1] Benzalkonium chloride—concentration of treating solution.
[2] Phenyl mercuric acetate—concentration of treating solution.
[3] Trichlorocarbanilide—concentration of treating solution.
[4] Zone width in mm. C = Complete inhibition under swatch. P = Partial inhibition under swatch. O = No inhibition under swatch.

AATCC Calendar

COUNCIL, COUNCIL COMMITTEES, RESEARCH COMMITTEES

April 1-3 (Hotel McAlpin, New York, NY)
April 1—Research Committees
April 2—Council Committees, TCR, ECR
April 3 (AM)—Council Meeting

May 29, 1959 (Mount Royal Hotel, Montreal, Canada) AM-Council meeting; PM-Joint luncheon and technical session with CATCC

NATIONAL CONVENTIONS

Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa.); September 28-30, 1961 (Buffalo, NY); 1952 (Southern Region)

HUDSON-MOHAWK SECTION

Mar 27 (Chelsea House, Tribes Hill, NY); May 15 (Ladies night, Albany area); June 26 (Annual outing—Antlers Country Club, Tribes Hill, NY)

MID-WEST SECTION

Feb 14 (Bismarck Hotel, Chicago, Ill); May 2 (Schroeder Hotel, Milwaukee, Wis); June 12-13 (Outing—Brown Lake Resort, Burlington, Wis)

METROPOLITAN SECTION

Feb 27 (Kohler's Swiss Chalet, Rochelle Park, NJ)

NIAGARA FRONTIER SECTION

Feb 20 (Niagara Falls, Ont); April 4 (Hamilton, Ont—joint meeting with CATCC)

NORTHERN NEW ENGLAND

Mar 20 (Hotel 128, Dedham, Mass)

PIEDMONT SECTION

April 10-11 (Robert E Lee Hotel, Winston-Salem, NC); June 5-7 (Outing—Grove Park Inn, Asheville, NC); Sept 25-26 (Barringer Hotel, Charlotte, NC)

SOUTH CENTRAL SECTION

Mar 21, Sept 19 (Hotel Patten, Chattanooga, Tenn); June 26-27 (Outing—Riverside Hotel, Gatlinburg, Tenn)

SOUTHEASTERN SECTION

Feb 21 (Ida Cason Callaway Gardens, Pine Mtn, Ga); April 18 (National Guard Armory, Cedartown, Ga); June 12-14 (Summer Outing—Radium Springs, Ga); Sept 12 (Ida Cason Callaway Gardens, Pine Mtn, Ga); Dec 5 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION

Mar 6 (Manero's Restaurant, Berlin, Conn); Apr 17 (Rapp's Restaurant, Shelton, Conn); May 15 (Ladies' Night—Rapp's Paradise Inn, Ansonia, Conn); June 12 (Outing—Wallingford, Conn); Sept 25 (Blake's Restaurant, Springfield, Mass); Oct 23 (Annual Meeting—Rapp's Restaurant, Shelton, Conn); Dec 4 (Hartford, Conn)

AATCC WASH-AND-WEAR TEST REPRINTS AVAILABLE

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GREAT interest has been shown in AATCC Tentative Test Method 88-1958, "Wash-and-Wear Fabrics—Appearance After Home Laundering" since it was published in the August 25, 1958, issue of the American Dyestuff Reporter. This situation has been emphasized currently by numerous requests for single reprints and especially for quantity reprint orders.

For the convenience of AATCC individual and corporate members, as well as readers of the American Dyestuff Reporter, a second reprinting of the article is planned.

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Metropolitan Section———

DYEING AND FINISHING OF KODEL FIBER AND FABRICS*

W R IVEY JR
Fiber Development Div
Tennessee Eastman Co

INTRODUCTION

WITH the many fibers in more or less common usage in today's textile fabrics, the producers of man-made fibers realize, full well, that most of you, the dyers and finishers, hold the success of these fibers securely in your hands. With the recent announcement by Eastman Chemical Products, Inc that Kodel polyester fiber would soon be appearing in marketable fabrics, a most important question naturally arose in your minds: just how can this fiber be dyed and finished to meet the demands of the consumers. To those of us that have been working with Kodel since its discovery some four years ago, there has developed a confidence, born of literally thousands of laboratory samples, small poundage or yardage processed in scaled-down commercial equipment, and finally the commercial lots themselves.

I would like to discuss the general practices and procedures that have been the outgrowth of these years of evaluation of Kodel and various blends with other fibers. In a meeting such as this, I cannot hope to give a completely detailed account of all likely blends, dyeing methods, or circumstances that will surely arise in some of your plants. Because of this, we can expect, and will welcome the opportunity, to discuss and work closely with many of you on details of particular blends or processing methods that will suit the equipment available in your individual plants.

DYEING

The preparation of Kodel or Kodel-blend fabrics for dyeing is much the same as with others of the newer man-made fibers. Those fabrics containing water-insoluble sizing materials should be treated with an enzyme prior to scouring. Conventional desizing agents can be used for this operation. After the size is solubilized, the goods are scoured in a bath containing a synthetic detergent and an alkali, such as tetrasodium pyrophosphate, sodium carbonate, or trisodium phosphate. This is normally sufficient to remove spinning lubricants, floor dirt, and some processing oils that might have been picked up during spinning and weaving. There undoubtedly will be occasions when fabrics have become very dirty and stained with oil or grease, and the addition of a refined aliphatic-hydrocarbon solvent to the scouring bath has proved very effective in cleaning these goods for dyeing.

For many spun fabrics, we have found it advantageous to provide an open-width wetting out and partial scour on such as a Hinniken boil-off machine before the goods are handled in rope form. By using temperatures as near the boil as possible, we allow yarn and fabric shrinkage to take place; and there is less of a tendency of creasing or "rope marks" occurring in later dyeing. A more complete scour should be carried out in the dye beck prior to the dyeing operation itself.

The bleaching of Kodel is normally unnecessary since it is a very white fiber. Certain circumstances may call for further whitening or the fabrics may have become heavily stained or discolored; in such an event we would recommend sodium chlorite as the most effective bleaching agent. A bleach bath containing one to four grams per liter of sodium chlorite and one to four grams per liter of formic or oxalic acid is recommended and bleaching is carried out at 190° to 200° F for one to two hours.

In recent months, several bleaching assistants have become commercially available for use in bleaching with sodium chlorite to retard the release of chlorine dioxide, thus slowing down the bleaching action and lessening the corrosive effect on equipment. Evaluation of such materials, eg, a buffered sodium sulfonate of an alkyl oleate, has indicated that one to four grams per liter of these assistants in the bleaching bath is beneficial.

Care should be taken in using chlorite bleaching materials both as to personnel and equipment. The possible hazards are familiar to all of you.

In the event that Kodel is blended with another fiber that requires bleaching, hydrogen peroxide or sodium hypochlorite may be used without affecting the Kodel.

Kodel may be dyed with either of two classes of dyes: the disperse dyes and the developed or azoic dyes. Proper selection of dyes from these two groups will normally provide very satisfactory fastness properties for the end uses in which Kodel is intended. The dyeing of Kodel under normal atmospheric conditions will not allow a sufficient dye take-up to provide a workable range of shades. To increase the rate of dyeing, carriers are added to the dyebath and a complete range of shades can be obtained possessing excellent fastness properties.

The proper selection of a carrier for Kodel is all important to the successful dyeing of this fiber. In our evaluation program, we have examined a great number of materials that are commercially available as well as many experimental products. We have found that the phenylphenols and the chlorinated benzenes in their presently available commercial forms are not satisfactory for use on Kodel because they cause a too rapid strike of the dye, resulting in poorly penetrated and mottled dyeings. Of course, the chlorinated benzenes have other disadvantages in that they are toxic materials and are hazardous to use unless extreme care is taken. The carriers that we have found to give the best results on Kodel are Carrier DAC 888, Cyanatex Dyeing Assistant EM, and Latyl Carrier A. Among the experimental products that have shown some promise are esters and mixed esters of terephthalic acid and derivatives and esters of aromatic acids. All of these materials will provide a uniform and level exhaust of the dyes on Kodel. We realize that only the surface has been scratched in evaluating carriers and carrier methods for dyeing Kodel, and we know that there are untapped reserves of compounds that will aid in dyeing this fiber. We are continuing our research and development program to find new carriers that

*Presented before the Metropolitan Section on Dec 12, 1958 at Kohler's Swiss Chalet, Rochelle Park, N.J. A similar presentation of this paper was made before the New York Section, AATT, on Dec 3, 1958.

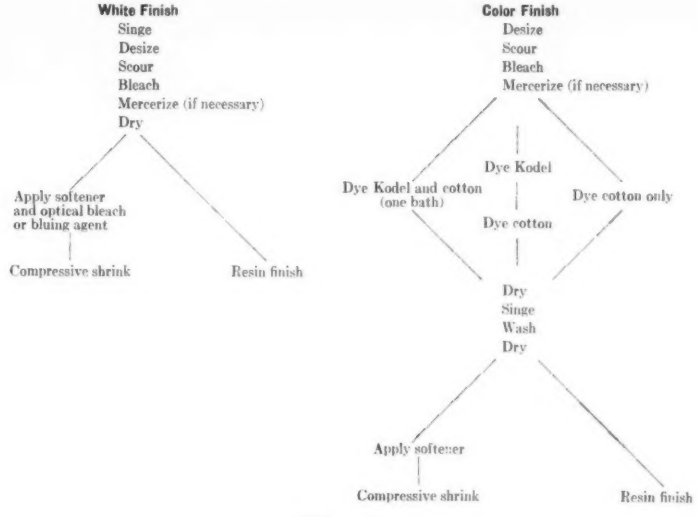

Figure 1
Typical procedures for finishing Kodel-cotton fabrics

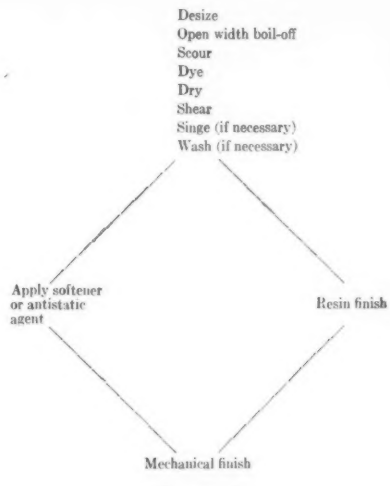

Figure 2
Typical procedure for finishing Kodel-rayon fabrics

will do an even more efficient and economical job. In the meantime, we expect to continue using the carriers mentioned, which have done extremely well thus far; new carriers will be put to use only after exhaustive study.

Some of the Eastman dyes which have been found to give excellent results on Kodel are shown in Table I and, from this group, selections may be made to provide sufficient fastness for the intended end uses.

The application of the disperse dyes in the presence of a carrier at normal atmospheric conditions is a single operation. A general procedure for dyeing Kodel would involve adjusting the bath at a temperature of 110° to 120° F and adding the dyebath assistants, including the carrier. After twenty minutes circulation, the disperse dyes are added and allowed to circulate uniformly through the bath before the temperature is raised. A slow elevation of the temperature to about 200° to 205° F and a running time of one to two hours completes the dyeing unless additions of dye are necessary. If dye must be added to obtain the correct shade, the dyebath should be cooled to 180° F before the addition is made. Following the cooling and rinsing of the fiber or fabric, an alkaline scour should be carried out to insure complete removal of any residual carrier or excess dye.

In applying the developed dyes to Kodel, a two-step procedure is necessary. The base and naphthol are applied together in the presence of a carrier followed by a thorough scouring. The second step involves the diazotization with sodium nitrite and sulfuric acid at 180° to 190° F. A final scour, as severe as the fabric will allow, completes the operation.

Kodel may also be dyed at temperatures above 212° F in various types of pressure equipment with excellent results. The higher temperatures markedly increase the dye absorption of Kodel and no carrrier is necessary for this type of application.

A note of caution in the dyeing of Kodel by either the carrier method or in pressure equipment: Dyes will begin a level and uniform exhaust on the fiber at fairly low temperatures. Rapid increases in temperature should be avoided so as to prevent uneven and streaked dyeings. This does not imply that unreasonable precautions must be taken; normally, good dyehouse procedures are satisfactory.

In dyeing Kodel in the presence of a carrier, a temperature of 200° to 205° F is sufficient to provide good exhaustion, leveling, and penetration of the dye. We have not found it necessary to approach the boil by the use of additional heating elements or by using sparger steam in the top of the dyebecks.

Blends of Kodel and the cellulosic fibers, cotton or rayon, normally may be dyed in a single bath using the disperse dyes and a carrier for the Kodel and direct dyes for the cotton or rayon. The dyeing should first be carried out at 200° to 205° F to exhaust the dyes on the Kodel and then cooled to 180° F to exhaust the direct dyes. If fastness properties superior to those offered by the after-treated direct dyes are required, the Kodel may be dyed first with disperse dyes following which the rayon or cotton may be dyed in a separate operation with vat dyes.

Figures 1 and 2 are offered only as illustrations of typical procedures for the processing of blends of Kodel and cotton or Kodel and rayon. We have found them to give excellent

TABLE I
Eastman dyes for Kodel fiber

Dye	Build-up	Fastness		
		Light	*Washing*	*Sublimation*
Polyester Yellow W	fair	excellent	excellent	excellent
Fast Yellow 2R-GLF	good	excellent	excellent	excellent
Polyester Yellow RL	good	excellent	good	fair
Polyester Yellow 5R	excellent	excellent	fair	excellent
Polyester Orange 3RLN	excellent	good	good	good
Polyester Pink LB	good	excellent	excellent	excellent
Polyester Pink RL	good	excellent	excellent	excellent
Polyester Red 2G	fair	fair	fair	excellent
Polyester Dark Red FL	excellent	good	fair	excellent
Polyester Red B	excellent	fair	excellent	excellent
Fast Blue B-GLF	good	excellent	excellent	excellent
Polyester Blue 3RL	good	good	excellent	excellent
Polyester Blue BLF	excellent	excellent	good	excellent
Polyester Blue RL	excellent	excellent	good	excellent
Polyester Diazo Black B	excellent	excellent	excellent	excellent

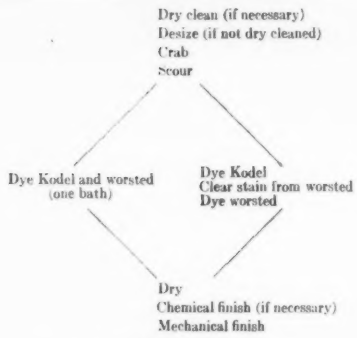

Figure 3
Typical procedure for finishing Kodel-worsted fabrics

results; but we also realize that they can be modified to suit the equipment and to some degree the routines followed in certain plants.

Blends of Kodel and wool may be dyed by either a one- or two-bath method, depending on the end-use fastness that may be required. Disperse dyes stain wool to varying degrees and this stain is generally poor in colorfastness; so it is necessary to make a careful selection to minimize this stain. For best fastness properties, a one-bath dyeing of both fibers should be carried out using the neutral (metalized) dyes for the wool portion of the blend. If a two-bath procedure is used, the Kodel is dyed first with a carrier, the stain is removed from the wool by scouring, and then the wool is dyed to the desired shade in a second bath. Figures 3 and 4 represent typical procedures that might be followed in processing worsted and woolen blends of Kodel.

There are many other blends that could become quite popular such as blends of Kodel with acrylics, polyamides, linen and others, but time does not allow a discussion of these at this meeting.

FINISHING

The finishing of fabrics containing Kodel could well be a program in itself; but, a few of the most important points should be mentioned here. Chemical finishing of 100% Kodel fabrics or those containing a high percentage of Kodel is generally unnecessary since the fiber exhibits an excellent hand and physical properties, such as wrinkle recovery, shrinkage control, and "wash-and-wear" features. It may be necessary at times to vary the hand by the use of softeners or thermoplastic resins or to apply antistatic agents or water repellents, but the use of these materials should be carefully considered since other of the excellent fiber properties might be adversely affected. Fabrics containing lower percentages of Kodel may be resin-finished to build up the optimum hand and functional properties of the other fiber in the blend with little effect on the Kodel.

Mechanical finishing of Kodel fabrics will usually be required for the utmost in appearance and performance of these fabrics. Singeing, brushing, shearing, napping, and decating may be required depending on the fabric type. Singeing of Kodel fabrics as was discussed in the earlier procedures should be done after dyeing as the melted ends of the fibers will dye heavier than the fiber surfaces and specky dyeings will result.

Heatsetting may prove to be an advantage on certain styles of Kodel fabrics, although it is not considered necessary to provide excellent dimensional stability, wrinkle recovery, pilling resistance, or "wash-and-wear" properties. If it is necessary, the heatsetting operation may be carried out on either a heated roll or in a clip or pin tenter frame. Careful control is necessary to insure a uniform application of heat over the entire fabric surface. Temperatures of 375° to 425° F may be used for durations of 10 to 30 seconds depending on the type of equipment used. Experimentation on one's own equipment should be carried out to insure the best time and temperature for heatsetting.

I would like to point out the collection of fabrics and garments on display here and the many shades that have been dyed successfully on the various blends of Kodel and other man-made or natural fibers. These all represent practical commercial dyeings rather than laboratory samples.

These garments as well as many more that have been made over the past several years have been used to accumulate data on the properties of Kodel and what the ultimate consumer can expect from this fiber. These test garments as well as information gathered from various laboratory testing equipment have established our belief that Kodel will offer outstanding advantages for men's, women's, and children's apparel. We have no illusion that Kodel is an all-purpose or miracle fiber; as these qualifications have yet to appear in any single fiber. We do feel that the properties of Kodel when reflected in a properly finished fabric are such that excellent performance can be expected.

Kodel blended with other fibers in the proper proportions has produced

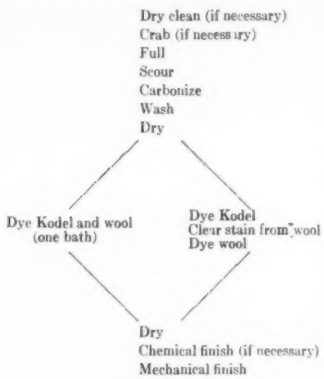

Figure 4
Typical procedure for finishing Kodel-wool fabrics

fabrics and garments that remain fresh and neat throughout the day's wearing because of Kodel's resistance to wrinkling or mussing. Properly engineered fabrics and garments of Kodel possess the "wash-and-wear" or "easy-care" properties that are so much in demand by today's housewife—just launder them in the washing machine; drip dry, line dry or tumble dry them and they are ready for wear again with no ironing or, at most, minor touching up of collars, cuffs, or other critical areas for the more fastidious dresser.

If touch-up ironing is necessary, another property of Kodel will serve to advantage: Kodel's heat resistance is high and fabrics may be safely ironed at temperatures as high as 425° F, a higher temperature than that recommended for most other man-made fibers.

Kodel has a high resistance to pilling and this property will vastly extend the range of fabrics able to honestly bear the "stay fresh" or "wash-and-wear" label. Sheen gabardines, medium and heavy weight woolens and worsteds, flannels and oxford shirtings are only a few of the fabrics that have been made from Kodel and have performed in our laboratory and consumer wear tests.

Certainly a prerequisite to "wash and wear" is dimensional stability and Kodel is excellent in this respect. Kodel fiber will shrink less than 1% in boiling water and this property is reflected in properly finished fabrics and garments. There should be no problems of garments shrinking or stretching out of shape so that they are no longer wearable.

Other properties such as low specific gravity, covering power, resilience, and a pleasant hand or feel should give Kodel a preferred position for many uses.

CONCLUSION

In closing, I know that there are many points that were not covered in this discussion. We have tried to give you at least a brief insight into Kodel, the newest of today's textile fibers. We are the first to admit that we do not yet know all of the answers. Just as we are still learning about the oldest of the textile fibers, wool and cotton, we will be learning for many years to come about new and better ways for dyeing and finishing Kodel. We welcome your questions, criticisms and suggestions and offer the facilities of Tennessee Eastman Company and Eastman Chemical Products, Inc to assist you in every way that we can.

ACTIVITIES OF THE LOCAL SECTIONS

Northern New England

WITH a bow of thanks to its past chairmen and its secretary of long standing, the Northern New England Section opened its 1959 season at the Colonial Country Club, Lynnfield, Mass, on January 16 under the direction of its newly elected chairman, Robert D Robinson. Appreciation was in the form of a placque presented by retiring chairman Edward B Bell to each of the former chairmen who had served the group. The following past chairmen were present to receive the award:

Harold W Leitch (1927-8)
Henry D Grimes (1931-2)
Leverett N Putnam (1933-4)
Roland E Derby (1935-6)
Carl Z Draves (1937-8)
Clarence L Nutting (1939-40)
John N Dalton (1941-2)
Edward S Chapin (1943-4)
George O Linberg (1947-8)
C Wendall Lever (1951-2)
Ernest R Kaswell (1953-4)
Edward B Bell (1957-8)

Dennis O'Neil received the award posthumously for his father, Frank J O'Neil (1949-50). Unable to attend the presentation were William H Cady (1929-30), Delbert Ray (1945-6) and John M Gould (1955-6).

Azel W Mack, retiring as secretary of the Section after seventeen years of service, was honored by the group. A bouquet of flowers was presented to Mrs Mack while Azel received an MIT chair from Ernest Kaswell and George Linberg on behalf of the group.

Myron J Coplan, asst dir, Fabric Research Laboratories, Inc, Dedham, Mass, presented a paper, "Some Aspects in Fiber Blending," in which he pointed out that two and two do not always make four when different fibers are added to a blend. Wholly unexpected results may be obtained if the complete physical characteristics of all fibers going into the blend are not considered with respect to the final end product, he stated.

Mr and Mrs Azel W Mack, who were honored by the Northern New England Section on January 16

Myron J Coplan, featured speaker at January 16th meeting of the Northern New England Section

OLNEY MEDAL AWARD CANDIDATES

THE Olney Medal Award Committee invites Senior members of AATCC to nominate candidates for the 1959 Olney Medal.

The medal is awarded for outstanding achievement in the field of textile chemistry, including the development of chemical agents or chemical processes used in the manufacture of textiles, or methods of their evaluation. Its purposes are to encourage and afford public recognition to such achievements and contributions and to be a testimonial to Dr Louis Atwell Olney in recognition of his life-time of devotion and multitudinous contributions to this field.

Nominations should set forth in detail all facts which qualify the candidate of consideration, with particular reference to published works and professional qualifications.

Previous winners of the Olney Medal are: Milton Harris, William H Cady, Edward R Schwarz, Harold M Chase, Charles A Seibert, George L Royer, Raymond W Jacoby, Werner von Bergen, Roland E Derby, William D Appel, Miles A Dahlen, Walter J Hamburger, P J Wood, and Henry E Millson.

The voting members of the committee on awards are: Paul L Meunier, *Chairman;* Edward W Lawrence, Milton Harris, James L Taylor, and President Weldon G Helmus, ex-officio.

Nominating letters and complete data should be in the hands of the committee by April 1. 1959. Please address to G P Paine, secretary, Olney Medal Committee, AATCC National Headquarters, Box 28, Lowell, Mass.

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Abstracts———

(*Concluded from page 80*)

Most of the natural dyes in use before the discovery of the first synthetic dye were applied on a metallic mordant. While alum was the most important mordant, copper salts were also used; eg, they gave a brown shade with madder and a bluish purple with cochineal. They were of special importance in logwood dyeing, by oxidizing the colorless hematoxylin to the dye hematein. A copper sulfate/alum mordant was used with logwood for blue shades, and a copper/iron mordant for blacks. Fast brown shades were dyed with cutch, with an addition of a copper salt. Here the copper acted as an oxidizing agent, to develop the brown color.

Dyers have long known that of all mordant salts copper compounds afford the fastest-to-light dyeings When Benzo Azurine G, one of the early synthetic dyes, was put on the market about 1885, it was found that an after-treatment with copper sulfate increased its lightfastness markedly. Unfortunately, the improved fastness was lost if the fabric was later washed. At that time the molecular structure of dye-metal complexes was unknown.

In 1905 Alfred Werner announced his "coordination theory" which laid the foundation for the chemistry of dye-metal complexes. According to his theory, a central metal atom is surrounded by atoms or groups in spherical arrangement to form a complex. The number of sites about the central atom — known as the co-ordination number — is a characteristic of each metal, being 6 for chrome, cobalt, iron and aluminum and 4 for nickel and copper. The groups coordinated to the metal atom may also form part of organic molecules, eg, of dyestuffs.

This theory provided an insight into the mechanism of mordant dyeing and metallization by after-treatment, namely, that natural and synthetic dyes combine with the metal of the mordanting agent to form complexes in the textile fibers treated.

The next step was to incorporate the copper atom in the dye molecule prior to dyeing, so as to obtain enhanced fastness to light. This was the basis of the Chlorantine Fast dyes, and later of the Sirius Fast range.

About this time it was found that certain atom groups in the dye molecule, when after-treated with a copper salt, produced complexes that would withstand repeated washing. The Coprantine and Benzo Fast Copper dyes belong to this group.

By combining cationic agents with copper salts in the after-treatment, the metal complex was formed, and in addition the sulfonic acid groups in the dye were blocked, thus increasing the washfastness. Coprantex A and Cuprofix are based on this principle.

Copper phthalocyanine, the well-known pigment, occupies a special position among the metal complexes of synthetic dyes as the only copper-complex dye without an azo group.

Still another use of copper in dyeing is in the cuprous-ion technique of coloring acrylic fibers with acid dyes, which cannot be applied by conventional methods. Ion linkage of the positively charged copper causes the negatively charged dyestuff ion to be fixed in the fiber.

Copper salts have also been used to promote oxidation in the dyeing and printing of aniline black.

Some Tests for Distinguishing Between Polyamide and Polyester Fibers

Bigler, N, *Ciba Rev* #127, 30-5, July, 1958

Cross-sections of polyamide and polyester fibers show no difference under the microscope; also a burning test gives the same result in both cases (a hard white melt). However, if the fibers are dry-distilled in a test-tube, polyamides develop basic vapors while polyester vapors are weakly acid, as shown by moist litmus paper. Also the nitrogen in polyamide fibers can be converted to cyanide and precipitated as Prussian blue.

The author discusses five special methods for differentiation of polyamide (nylon 6, 11 and 66) and polyester (Dacron) fibers:

1) Determination of amino and imino groups (after Wallin). The sample is treated with phenol and sodium hypochlorite. An intense blue color develops in presence of NH_2 or NH groups (nylon). Dacron remains colorless.

2) Determination of terephthalic acid in polyester fibers. The sample is heated with alcoholic potash until completely degraded, and neutralized with sulfuric acid. Terephthalic acid is precipitated. This is filtered, redissolved with caustic soda, and reprecipitated with baryta water as barium terephthalate, crystals of which are identified under the microscope.

3) Solvent test. The sample is treated with HCl conc, HNO_3 conc, phosphoric acid conc, formic acid, glacial acetic acid, and phenol 80%. A table gives the solubility of the three nylons and Dacron in these six solvents. Polyester fibers are soluble in *hot* phenol but insoluble in *cold.*

4) Reactions under the microscope. Nylon 6 and 66 dissolve rapidly in zinc chlor-iodide/alcohol 1:1; nylon 11 is inert to this reagent. Nylon 6 and 11 dissolve rapidly in sulfuric acid/amyl acetate 1:2; nylon 66 swells very little or hardly at all.

5) Determination of melting point. The softening and m p's of synthetic fibers are often used as analytical data. The fiber sample is boiled in benzyl alcohol (b p 213-5). Nylon 6 (m p 215°C) and nylon 11 (m p 185°C) melt; nylon 66 (m p 250°C) is unchanged. Dacron is *soluble* in boiling benzyl alcohol.

Staining Technique Utilizes Two-Dye Solution

Smith, R M, *Textile Research J* **28**, 1049-51, Dec, 1958

The author has developed "a fast and simple method for staining and permanently mounting cross-sections," in which the same two dyes are always used and in which the dye solutions act as the mounting medium. The method is primarily useful for determining the location of known fibers and other materials in the section, but may also be used to help identify unknown components.

The method consists of a combination of a water solution of Methylene Blue and an alcohol solution of Sudan III.

For cross-sectioning, the author usually uses a Hardy microtome and anchors the section to the slide with egg albumin. A drop of the Sudan III solution is then applied to the section, followed by a drop of Methylene Blue. A cover glass is then placed on the drops of dye and pressed down so that excess dye is exuded around the edge of the cover glass. The excess dye, when dried, forms a protective film around the edge, and this gives the slide its permanence.

Since all materials have a characteristic affinity or lack of affinity for each dye, each material takes on its own characteristic color when subjected to the two dyes. In general, hydrophilic materials show affinity for Methylene Blue and hydrophobic materials attract the Sudan III.

For example, when examined under the microscope, cotton, rayon, cellophane and paper will be found to be colored blue; acrylate polymers, ethyl cellulose, polyamide resins, vinyl pyridine copolymers and natural rubber will be colored orange to orange-yellow; cellulose acetate will be green. Dacron, Mylar and nylon are said to be unaffected by either dye.

The author cautions that some materials do not develop any color until the slide has aged two hours or more.

News of the Trade

Symposium on Melt-Spun Fibers to Highlight TRI's Annual Meeting

A symposium on the properties and potentials of organic, melt-spun fibers is to be an outstanding feature of Textile Research Institute's 29th Annual Meeting, at the Hotel Commodore, New York, NY, Monday and Tuesday, March 23rd and 24th.

The program for the two-day meeting, arranged by J B Goldberg, general chairman of the meeting, will be organized as follows:

Opening the meeting on Monday will be presentations of TRI research in 1958 by Howard J White Jr, TRI's director of research, and other senior members of his staff.

The luncheon speaker on Monday, yet to be announced, is expected to be an eminent scientist of international reputation in the space and nuclear age.

Several other timely papers will be given on Monday of general interest and importance. Topics covered will include: "Heat Effects on Tire Cord Materials," "Three-dimensional Weaving," and "Patents and the Scientist."

A meeting of the TRI Board of Trustees will be held on Monday afternoon for the purpose of electing officers for the coming year.

The symposium on melt-spun fibers, under the chairmanship of S Jack Davis, manager, textile applications research, The Chemstrand Corp, will constitute the full day's sessions on Tuesday. The program, as now developed, will include talks on polyamide, polyester, and polyolefin fibers—nylon 6, nylon 66, Dacron, Kodel, polyethylene, and polypropylene—presented by speakers from E I duPont de Nemours & Co, Inc; Allied Chemical Corp; Tennessee Eastman Co; and Reeves Brothers, Inc. A panel discussion will be the closing feature of the symposium.

Tuesday's luncheon talk, "The State of the Institute," will be given by TRI's president, Walter Regnery, Joanna Cotton Mills Co.

Immediately adjacent to the meeting room, in the Commodore Ball Rooms, TRI is again arranging for an exhibit of the latest developments in testing equipment, instrumentation and fiber displays. This exhibit will be open to the public without charge.

The Annual Meeting is open to all. There will be a $10.00 registration fee and luncheon tickets will be available for $6.00 each day. Advance reservations may be made by writing to the Institute's secretary, P O Box No 625, Princeton, NJ.

"TEXTILE CHEMISTRY—FIELD WITH A FUTURE"

As its contribution to the current efforts to interest high school students in a career in textile chemistry, Wica Chemicals, Inc, Charlotte, NC, has sponsored a noncommercial, color-sound film entitled "Textile Chemistry—Field with a Future". The film, produced under the supervision of the Walter J Klein Agency, also of Charlotte, was sponsored by the Wica organization because of the growing need for additional textile chemists, to point out to high-school students the opportunities that are available to them in the textile field, and to call their attention to the educational facilities that the textile colleges offer them. Commenting on the opportunities in this field, William C Caldwell, Wica president, says:

"Textile chemistry and dyeing offer the most unusual opportunities of any profession; the reason is obvious—we are entering an era such as never before dreamed. Textile chemistry can only grow and prosper with the influx of young people. There are literally hundreds of new chemicals being made available to the textile chemist. In many cases he, or she, is calling the shots as the needs for special chemicals are found. American chemical manufacturers are just scratching the surface."

There is a definite demand for many additional textile chemists, Mr Caldwell points out, because of the increased activities in research, quality control and production at the finishing plant level. In addition to textile plant personnel, textile chemists are also needed by manufacturers of synthetic fibers, chemical and dye manufacturers, processing machinery manufacturers, professional organizations, government and educational groups who are sponsoring research and development in textiles, consulting services, laboratories of consumer publications and large retailers, and by technical sales organizations.

The movie was designed to point out a few of the chemistry and dyeing aspects with some direct associations in our everyday lives—how chemistry affects us, the many obvious frontiers and the chances for recognition for those who enter the profession.

A preview of the film was held in Charlotte for textile educators and others on January 9th and everyone present enthusiastically agreed that the film would serve a definitely needed function in conjunction with other efforts by industry. The film was also previewed at the AATCC Council meeting on January 30th in New York.

Prints of the film are being made available to the textile colleges for use in their particular areas. In addition, high school guidance directors, science and chemistry teachers will be advised of the availability of the film through Modern Talking Picture Service, Inc, 3 East 45th St, New York 22, NY, which will handle bookings to TV, civic and educational groups.

A brochure is being prepared on the subject, which will be sent to high school educators, and folders will be available for distribution to students during the showing of the film.

NYPC Meeting Schedule

The New York Pigment Club, which has its dinner meetings and technical discussions the second Thursday of each month at Fraunces Tavern, New York, NY, has announced the following Spring Program:

February 11—George E Meyers, Rona Laboratories, Inc, Bayonne, NJ —"Nacreous Pigments and Metallic Effects."

March 12—Milton Zucker, Sweedler & Zucker, New York, NY—"Patenting Pigment Inventions."

April 9—Emil A Wich, General Dyestuff Co, New York, NY—"Pigment Dispersions with Acetylene Derivatives."

At the January meeting, Herbert H Johnson, H Kohnstamm & Co, Inc, was elected president for 1959. The other officers are: *Vice-President*—Robert U Copland, L & R Organic Products Co; *Secretary*—Robert E Brouillard, General Dyestuff Co; *Treasurer*—Peter Ricciardi, E I du-Pont de Nemours & Co, Inc.

New Charlotte Plant for General Latex

General Latex & Chemical Corp, Cambridge, Mass, has announced the opening of a large new compounding plant—the company's sixth—at 2321 N Davidson Street, Charlotte, NC.

In full operation since November 17th, the new plant has a fully integrated staff, research and development laboratories and complete facilities for compounding rubber latices for the textile, rubber, automotive and upholstery industries. In addition, the facility will provide customers in the area with the complete line of General Latex products, including Harrisons & Crosfield Malayan Latex and Goodyear Pliolite Latices.

Key personnel includes District Sales Manager Jack Hobbs; Sales Representative Ernest Horton; and Chief Control Chemist Everett Eldridge.

The plant covers an area of 25,000 square feet.

Construction Started on New RCI Chemical Plant

Reichhold Chemicals, Inc, has started construction of a new $5 million chemical plant on a site adjacent to the firm's existing plant at Elizabeth, NJ.

Civic officials and dignitaries of both Linden and Elizabeth—the new plant will straddle the dividing line—attended a ceremony on January 23rd in which Stefan Baum, executive vice president of the chemical concern, started huge pile driving machinery.

Scheduled for completion late in 1959, the plant will produce some 30 million pounds annually of phthalic anhydride. Production will be by the fluid bed catalyst technique. The plant's 30 million pound yearly capacity will make it one of the largest in the world to use this method and the design leaves plenty of room for future expansion, it is stated.

Current employment by Reichhold at its Elizabeth facilities is over 200—a figure which is slated to rise significantly when the new plant starts production later this year.

From RCI's point of view, the location of the new phthalic production unit is highly strategic. Reichhold is both a user and a supplier of this key chemical. The firm's existing phthalic anhydride plants are located at Detroit, Mich, with a capacity of approximately 25 million pounds per year, and Azusa, Calif, able to produce some 15 million pounds annually. Thus, the new Eastern Seaboard location gives RCI phthalic producing points at well-situated spots in three major industrial areas spanning the continent.

The company also produces phthalic anhydride in several foreign countries around the world: Australia, Canada, England, France and West Germany.

Phthalic facilities at the Elizabeth-Linden location are said to boost RCI's domestic capacity by some 75 percent and increase it from approximately 10 percent to about 16 percent of the total United States production capacity of phthalic anhydride made from naphthalene, the most important source.

Reichhold's Elizabeth plant currently produces maleic anhydride, several different types of synthetic resins (alkyd, phenolic, phenolic modified alkyd, urea-formaldehyde, polyester and special foundry resins), and emulsions of vinyl acetate and various resins.

* * *

First production of synthetic resins in Portugal has begun with the opening of a modern plant just north of Lisbon by Resinas Sinteticas, Lda (RESINTELA). The company is associated with Reichhold Chemie AG of Hamburg, Germany, and Reichhold Chemicals, Inc, of the USA.

The installation was set up under the guidance of Reichhold engineers and reportedly is equipped with the most up-to-date machinery available. Included in the 14-acre factory area are a pilot plant, a modern laboratory, offices, workmen's quarters and a hospital.

Already producing a number of Reichhold resins under Reichhold's formulas and technical know-how, RESINTELA plans to add basic chemicals to its production program.

Onyx Reorganizes Sales Department

The Textile, Paper and Industrial Divisions of the Onyx Oil & Chemical Co, Jersey City, NJ, have merged Sales Departments.

Irving Gaines, formerly Industrial Division sales manager has been promoted to general sales manager. Philip E Mac Lean, formerly Textile and Paper Division sales manager, has been promoted to sales manager.

This reorganization reportedly will result in more efficient utilization of technical service personnel and field sales force.

Metro-Atlantic Moves Jersey Office

Metro-Atlantic, Inc, Centredale, RI, has moved its New Jersey office, laboratory and warehouse facilities from Fair Lawn to 100 Wagaraw Road, Hawthorne, to provide better facilities and service to its customers in that area.

Ross E LeCompte will be in charge of the new facilities and all sales and service in this area will be handled through the new office and laboratories.

Phi Psi Concludes Series on Marketing

The textile industry can learn from the experience of other industries, according to William M McNeill, division manager in the General Purchasing Department of Union Carbide Corp, by encouraging purchases on the basis of the following three points, listed in order of importance: quality, availability, and price. "I know of no concern that is not willing to pay a fair price for a needed item," said the speaker, "and a little more statesmanship on the part of both buyers and sellers in the textile industry would go a long way toward improving profits all around."

Speaking to the New York Alumni Chapter of Phi Psi Textile Fraternity on January 16th, Mr McNeill, pointing out that purchasing agents have excellent selling opportunities and should take advantage of them, said "If I cannot convey to a salesman the idea that my company is an excellent outlet for his materials, then I'm falling down badly in my job. I want the salesman who calls on me to bring the new item, the new service, the new idea to me first—before he takes it across the street to my competitor."

This unusual and refreshing point of view on purchasing was presented at the last of the current Phi Psi series on marketing. As Roger E Lewis, Chapter President said, "Sales represents an everyday part of our lives, and we felt it would be fitting to present the ideas from a receiver rather than a supplier."

Drawing a parallel between selling and buying, the main speaker said that a purchasing agent has the same public relations job as a salesman: he must create good will for his company. "A competent purchasing agent—whether he be in the textile industry or anywhere else—has more tools in his kit than a chisel," the speaker concluded.

R&L Opens New Southern Office

Mid-January opening has been announced for the new Southern office of Riggs & Lombard, Inc at 227 West Third Street, Charlotte, NC.

L T Parkman, a sales engineer for Riggs & Lombard for the past five years, has been designated to head up the new office.

Mr Parkman will represent all three divisions—Riggs & Lombard, Inc, Cook Machine Co and Parks & Woolson—whose resources were recently combined under the Riggs & Lombard aegis.

Also based at the company's new Southern office is Jim Cook, of the Cook Manufacturing Co, Division of Riggs & Lombard. Mr Cook will specialize in activities concerned with cotton finishing and bleaching equipment.

Du Pont Grants to Colleges Exceed Million Dollars

Grants totaling nearly $1,200,000 have been awarded to 139 universities and colleges in the Du Pont Company's annual program of aid to education, the company has announced.

Du Pont Opens Electrochemicals Research Center at Niagara Falls

A new, modern research center for Du Pont's Electrochemicals Department was formally opened at Niagara Falls, NY, on January 16th.

A tour of the two-story building by civic and industrial leaders marked the opening of the laboratory, which is located adjacent to Du Pont's manufacturing plant on Buffalo Avenue.

Campbell Robertson, laboratory manager, said the new building will be the focal point for research and development work on products and processes vital to the department's established business in sodium, vinyl products, peroxygen compounds, nylon intermediates and related fields. In addition, laboratory personnel will pursue research leading to the development of new products.

The building itself has a floor area of 44,000 square feet and is occupied by about 100 persons. The building contains 15 laboratories, each equipped to serve two chemists, and two laboratories equipped for one each, three laboratories with special analytical equipment, a constant temperature room, lunch room, library, conference room and offices.

Construction is of brick and steel frame, with light green trim of vitreous enameled aluminum. The process for enameling aluminum is a development of the Electrochemicals Department research program. Another Electrochemicals research development, polyvinylacetate-based paint, is used on the interior masonry block walls.

Du Pont has operated a large manufacturing plant at Niagara Falls since 1930 when the company acquired the Roessler and Hasslacher Chemical Co, which had been identified with the city's industrial life since 1885.

Du Pont, as Roessler and Hasslacher before it, has brought to commercial development a number of important discoveries made under its research program at Niagara Falls. In the years since 1930, fundamental research has brought forth chemical products and processing techniques contributing to many important industrial developments, including the following:

Safe, effective drycleaning through the development of perchlorethylene solvent, which is nonflammable and nonexplosive.

An efficient system of continuous bleaching of cotton textiles through use of hydrogen peroxide.

A nonelectrolytic process for making hydrogen peroxide which has brought about important manufacturing economies.

A new route to chemical intermediates for nylon through use of furfural—a substance obtained from corn cobs, oat hulls or sugar cane—as a raw material. This discovery led to the development of tetrahydrofuran, an important solvent.

Since Du Pont has been located at Niagara Falls, the company reportedly has spent in excess of $20,000,000 for expansion projects, many of which stemmed from the research program conducted at the plant by the Electrochemicals Department. In 1957, the company as a whole is said to have spent $80,000,000 on research, exclusive of laboratory construction and technical assistance to sales.

• NEW PRODUCTS AND DEVELOPMENTS •

Cyanamid Introduces New Vat Dyes

Recent additions to American Cyanamid Company's line of Calcoloid vat dyes for cotton and rayon include Calcoloid Navy Blue 2GC Double Paste, a navy blue that is said to remain stable at dyeing temperatures as high as 250°F; Calcoloid Violet BNC Double Paste, a bluish violet dye that reportedly has excellent fastness to heat and moisture even in the lighter shades; and Calcoloid Gray 2BC Double Paste, which produces a neutral shade of gray.

Calcoloid Navy Blue 2GC Double Paste is described as a free-flowing, nonsettling, nonspecking, nondrying, paste type that has controlled particle size and fine application properties. Claimed to be an exceptionally versatile dye with superior all-around fastness, Calcoloid Navy Blue 2GC reportedly produces navy shades with a greenish cast and works readily on all types of piece goods dyeing equipment.

Of the various navy vat dyes tested in Cyanamid's laboratory, Calcoloid Navy Blue 2GC is the only one that did not color a drycleaning bath pink. A 0.3% available chlorine solution does not change its tone, it is claimed, and even in pale shades, its fastness to light is very good.

Because of its leuco stability at high temperatures, it is recommended by Cyanamid for dyeing stock, packages, cheeses and beams at temperatures above 140°F. Under dyeing conditions on the Williams unit range, it does not become redder and duller, it is claimed.

According to Cyanamid, fabrics dyed with this navy vat dye meet government specifications. Calcoloid Navy Blue 2GC is also said to be applicable to automotive and decorator fabrics, dress goods, shirtings, ginghams, slacks and matched slack and shirt sets, tapes, threads, knitting and tufting yarns.

Calcoloid Violet BNC Double Paste reportedly produces solid shades that are stable to ironing, pleating or water spotting. Even in pale shades, it is said to have excellent fastness to lig Its dyeings reportedly remain fast to chlorine, perspiration, drycleaning, washing and peroxide.

The manufacturer states that the unique fastness properties and good dyeing behavior of Calcoloid Violet BNC can be used to advantage in shading light blue or gray shades. It is claimed that, when it is used for dyeing cloth on jigs, becks or continuous ranges, the insensitivity of this new dye to heat and moisture aids in quick, accurate and confident shade matching. These same properties also are said to eliminate for the dyer such consumer complaints as over-all or local changes of shade from sprinkling, ironing or pleating the garments of other end-use products.

In stock, package, beam or skein dyehouses, where a level dyeing color

CORRECTION

Re: Listings in Annual Processing Review Number

YOUR attention is called to the following errors on pages 820 and 821 of the December 1, 1958 issue of *American Dyestuff Reporter* in the Alphabetical Listing of New Products Developed Since November, 1957.

On page 820, third column, the heading "Calcogene* Black 6GFC" should read "Calcogene Black 6GCF." The heading "Calcogene* Blue 2GFC Solution" has been set twice in the third column. This should be amended so that the first such heading reads "Calcogene* Blue 2GCF Solution." The second such heading should read "Calcogene Yellow SCF Solution."

On page 821, column 2, under the heading "Calcosperse* Violet B," 14th line, the word "Cyanate" should be amended to read "Cyanatex."

is a requisite, Calcoloid Violet BNC is said to be very useful. Because of its excellent color transfer property, initially unlevel dyeings are readily leveled at temperatures of 190°F or higher, it is claimed, and it has excellent leuco stability at temperatures as high as 250°F.

Because Calcoloid Violet BNC reduces easily, it may stain adjacent white material during strongly alkaline treatments. It is not suitable, therefore, for colored effects in fabrics that are scoured and bleached after weaving. Calcoloid Violet BNC reportedly can be used, however, for ginghams that are made from bleach yarns and toweling that is dyed after bleaching. Other applications recommended for the dye by Cyanamid include decorator fabrics, clothing, cotton hosiery, thread, knitting yarns and tufting yarns.

Calcoloid Gray 2BC Double Paste, which is said to be the only color of its type on the market, reportedly combines high fastness and good level dyeing properties with excellent working properties in all stages of manufacture and in all equipment.

Calcoloid Gray 2BC is designed to meet the increasing market demand for a more neutral shade of gray than that available with the company's older dye, Calcoloid Gray 2GC Double Paste. This new patented Cyanamid specialty is a member of the anthraquinone class of vat dyes.

A free-flowing paste type, Calcoloid Gray 2BC is said to have a fine, controlled particle size that insures rapid reduction and fixation. It is described as nonsettling, nonspecking and nondrying. Ratings on pigment and leuco filtration tests are excellent, it is claimed.

Calcoloid Gray 2BC reportedly has resistance to migration during drying and meets the special needs of pigment-pad processes, pad-jig, pad-steam or pad-Williams units. It is also said to be suitable for stock, package, cheese and beam dyeing. Cyanamid states that, because of the dye's excellent fastness properties, it withstands rigorous mill processing and destructive influences encountered in consumer use.

End uses recommended for the new dye by its manufacturer include automotive fabrics, awnings and lawn furniture, decorator fabrics, clothing, hosiery, towels, thread, tufting and knitting yarns. The new dye is also said to be applicable to fabrics that must meet government specifications.

Laurel S D 50

Laurel S D 50, an amine neutralized alkyl aryl sulfonate of high activity, is prescribed by the Laurel Soap Mfg Co for a wide variety of uses in the textile and other wet processing industries.

For scouring, wetting, dye leveling or assisting, and emulsifying, Laurel S D 50 is said to exhibit an unusual combination of valuable properties. Described as "a good detergent," it reportedly offers ready rinseability, low alkalinity, stable foaming properties, no inorganic salt content, and excellent stability in acid and mild alkaline solutions.

For direct dyeing of cottons and rayons, Laurel S D 50 is said to have excellent leveling action and, in addition, the ability to penetrate the yarn to remove any knitting or weaving oils and lubricants to assure best dyeing.

For acid dyeing of wool, it is said to give fine results in the leveling and penetrating of acid dyes. Its stability in up to 2% sulfuric acid solutions—and its freedom from salts—make it a popular assistant for the wool dyer, according to the manufacturer.

For acetate dyeing it reportedly promotes good dye dispersion, retards the dyeing rate, and gives clear, bright shades.

In scouring of woolen piece goods and light scouring of cotton and synthetic yarns and fabrics it is said to give outstanding results. Laurel S D 50 also permits the simultaneous desizing, scouring, and dyeing of rayon fabrics, it is claimed.

For soaping off after dyeing, it is reported to be highly satisfactory and, being free rinsing, will not interfere with subsequent finishing treatments.

Still another application of the product is its use as a wetting agent in starch desizing baths. Its neutral-to-slightly acid pH (6.5—7.0) is said to give it an essentially non-inhibitory effect on the enzyme action. As a penetrant, it is said to be useful with coning, winding, and aftertreating emulsions where the presence of electrolytes might adversely effect the emulsion stability, or for latex compounds, and other uses where a stable, salt-free surface-active agent is required.

New Protovac Caseins

Manufacture of four new Protovac cold-water-soluble caseins, PV-424, PV-428, PV-430, and PV-800, has been announced by Borden Chem Co

Unlike most conventional caseins, which, after soaking and the addition of alkali, require up to 60 minutes of heating at from 130 to 180°F, the new Borden products are said to require only 10 minutes of alkali soaking and about 30 minutes of mixing at 60 to 80° F. The rate of solution can be increased by use of a high-speed mixer, such as the Cowles Dissolver, it is stated. High-speed mixing presents no foaming problems, Borden's reports, and use of the products eliminates the need for cooking equipment.

The four new caseins, designed for use in various applications, including textile finishing, are being shipped in 100-pound paper bags, which reportedly may be stored safely for more than a year.

Properties and uses of the new caseins as stated by Borden's follow:

PV-424—Complete solutions can be obtained at pH 9.0 in 10 minutes at 60°F. It has a very low ash and free acid content, low bacteria count, low alkali requirement, and high adhesive strength. PV-424 may be dissolved by any of the standard alkalis. Solutions may be held two or three days without preservatives. Longer storage requires the use of the usual casein preservatives.

PV-428—A sodium caseinate, this product is soluble in cold water with no additional alkali required. It is unique in that resulting solutions are of low pH at only 6.0.

PV-430—This is a low-foaming zinc casein. It requires the addition of ammonium hydroxide to obtain complete solution. On drying, the zinc casein film has excellent water resistance. No additives are required. It may be used wherever water-resistant films or coatings are required. Solutions of PV-430 have high viscosity and small amounts give considerable thickening when added to a latex. The product has excellent keeping qualities. Solutions usually may be held one to two weeks without preservatives. A unique feature of the product is that it does not swell in water.

PV-800—One of a series of biologically stable caseins, this product is of very low viscosity. Outstanding feature of PV-800 is that cold-cut solutions require no preservatives and may be kept for months without spoilage. Solutions are obtained by using any of the standard alkalis. Preservative action is built directly into the casein molecule. Cold-cut solutions prepared at 25 percent solids have viscosity of only 400 centipoises. PV-800 also is an excellent pigment dispersant. It has little thickening effect on latex, but it acts as an exceptionally good protective colloid. The product may be made water-resistant by using any of the standard procedures, such as treatment with formaldehyde or metallic salts. Tests indicate that it is not acutely toxic.

Additional information may be obtained from the Borden Chemical Company, Casein Department, 350 Madison Avenue, New York 17, NY.

RFB-X353

Easton R S Corp, 876 Pacific St, Brooklyn 38, NY has announced the development and production of a new chemical resin formaldehyde buffer named RFB-X353. The product is designed to protect cyclic-, ethylene, or methylated urea-formaldehyde resins as well as melamine-formaldehyde resin systems against "resin decay" or hydrolytic decomposition as evidenced by formaldehyde fume and/or amine odor generation, which is often encountered when washed or unwashed resinated goods are subjected to severe temperature and humidity changes.

During the past four years, Easton R S Corp has offered guaranteed control of free formaldehyde fumes in the ready-to-wear merchandising industry.

A descriptive bulletin entitled "A Resin Additive to Control Formaldehyde & Amine Fume Liberation" (TB#2A280) is available on request.

The manufacturer points out that RFB-X353 is not effective in the prevention of amine odor development from unwashed and unneutralized triazone resins, but does offer protection to cured triazone resins when it is added to the wash cycle to insure complete neutralization of amine derivatives.

"SAG" Antifoams

"SAG" Antifoams, recently placed on the market by Silicones Division, Union Carbide Corporation, are described by the firm as "new, fast-acting and highly effective foam killers for industrial use."

The new products come in two forms—"SAG" 47 Silicone Antifoam Fluid for non-aqueous systems and "SAG" 470 Silicone Antifoam Emulsion for aqueous foaming systems. Eight-ounce samples in polyethylene squeeze bottles are being distributed to industries desiring to evaluate them.

It is reported that only small quantities are required; often somewhere from 10 to 200 parts per million is all that is needed.

"SAG" 47 Silicone Antifoam Fluid is a 100% solids solution which can be used at full strength, or as a solvent solution, or blended with other materials. It is available in a one-pint, wide-mouth jar containing one pound; in a one gallon open top can containing eight pounds, and in a five-gallon open-top can containing 40 pounds.

"SAG" 470 Silicone Antifoam Emulsion contains 10% silicone solids by weight, and is ready for use, but can be further diluted if desired. It comes in one-gallon and five-gallon cans and in drums of 55 gallons.

These antifoams reportedly are chemically inert and resist oxidation over long periods. Their order of toxicity is said to be extremely low.

• NAMES IN THE NEWS •

Eilers

Louis K Eilers has been named president of Eastman Chemical Products, Inc, a marketing unit for products made by the Tennessee Eastman Co and Texas Eastman Co divisions of Eastman Kodak Co. He has also been appointed first vice president of the two divisions.

Dr Eilers, who has been vice president and assistant general manager of Eastman Kodak, succeeds **William S Vaughn**, who has been elected vice president and general manager of Eastman Kodak Co.

Harry D McNeeley has been named executive vice president of Tennessee Eastman and vice president of Eastman Chemical Products, Inc.

James E Murphy has been appointed as textile sales representative in the New York office of Eastman Chemical Products, Inc. He was transferred from the Greenville SC territorial office, where he had worked with Southern accounts for the past four years.

Richmond Harrison, former treasurer of the Borden and Remington Co, Fall River, Mass, has been made president.

Borden & Remington has announced the appointment of **George A Slade** as general sales manager of the Providence and Fall River Divisions. Mr Slade is in his 35th year with the company.

Cameron A Baker, United States Testing Co, has been elected president of the American Association for Textile Technology, succeeding **Gerald Lake**, Burlington Industries.

Other officers elected were **Kurt Winter**, first vice president; **Giles Hopkins**, second vice president; **Bernice Bronner**, secretary; and **Fred Simmons**, treasurer.

John Holland, **J Fred Murray** and **Genevieve Smith** were elected to the board of governors to serve three-year terms. **Ivan Y T Seng** was elected to serve on the Auditing Committee.

Joseph B Quig, associate professor of chemistry at Lowell Technological Institute, has been elected to fellowship in the Textile Institute.

Dr Quig was associated for more than 30 years with the fibers department of E I duPont de Nemours & Co, Inc, Wilmington, as manager of technical service, assistant director of development, and as manager in the textile research department.

Landes

Chester G Landes has been appointed technical director of Wica Chemicals, Inc, Charlotte, NC. Mr Landes, who for the past 22 years has been with the Stamford Research Laboratories of the American Cyanamid Company, has a number of patents and published technical treatises to his credit.

T F Cooke has been appointed commercial development manager for the Organic Chemicals Division, American Cyanamid Co.

He will be responsible for coordinating technical service, market research and market development functions of Cyanamid dye, textile chemical, explosives and mining chemical, rubber chemical, intermediate and petrochemical products.

Since 1945, Dr Cooke has served Cyanamid in numerous research and technical service managerial positions.

Fleer

Alfred W **Fleer**, formerly general manager of manufacturing, technical, for Shell Chemical Corp, has been named to head the new industrial chemicals division of the firm. The Division will handle all functions related to the products formerly sold by the chemical sales division—except for plastics and resins—including the plants at Houston, Tex, Norco, La, Dominguez, Calif, and Martinez, Calif, and the Houston research laboratory.

George W Huldrum Jr, who formerly headed the company's chemical sales division, has been named a vice president.

The new plastics and resins division is headed by **Martin Buck**, who was formerly assistant to the president.

The moves are part of a company reorganization which took effect January 1st, involving the formation of four fully integrated divisions.

Wilson Organic Chemicals, Inc, Sayreville, NJ, has announced the election of **Theodore S Hodgins**, president, and **John J Levenson Jr**, executive vice president, Century Chemical Corp, to the Wilson board of directors.

Wilson, organized in 1947, manufacturers, among its products, dyes, dye intermediates and phthalocyanine pigments.

Taylor

John R **Taylor** has been assigned to the staff of American Viscose Corporation's Technical and Textile Service Department at Marcus Hook, Pa.

Mr Taylor was named technical superintendent in 1956, the position he has held to the present.

Beekley

E C Brown Jr

Ronsick

The Chemical Division of The Goodyear Tire & Rubber Co has appointed **Nathan A Beekley Jr** special representative in the division's New York district, succeeding **Edward C Brown Jr**, who has been transferred to the division's Philadelphia office.

Beekley will be concerned primarily with the sale of Plioflex and Chemigum synthetic rubbers and Pliovic vinyl resins in New York, northeastern Pennsylvania and northern New Jersey. Brown's new assignment was made to supplement the division's activities throughout southeastern Pennsylvania, southern New Jersey, Delaware, Maryland and Virginia.

Edward G Ronsick has been appointed to the Division's Akron sales staff.

Myers

Frank F Myers has been named to succeed **Howard M Sprock** as manager of Geigy Dyestuffs' Charlotte NC office. Mr Sprock, who has been with Geigy for 36 years and served as Charlotte Branch manager since 1929, will go into partial retirement, representing the company in a number of accounts in the Charlotte area. Mr Myers has been with Geigy since 1935.

Weymouth

Fred A Weymouth has been designated a vice president of Interchemical Corp. His new duties will include responsibilities for production, plant and purchasing.

Formerly division vice president of the company's Printing Ink Division, Mr Weymouth has been associated with Interchemical for 29 years.

Victor H Boden has been appointed manager—product marketing for Union Carbide Chemicals Company, division of Union Carbide Corporation. In his new position, Mr Boden heads a group of five product sales managers, and with them, has the responsibility for planning and marketing direction of industrial chemicals.

The product sales managers are **Robert C Boltz, Howard L Harwell, Robert B Leonard, Frederick J Rauscher,** and **John M Russ**. Two of the product sales managers were recently promoted to their present positions—Mr Boltz from his former position of Eastern Division sales manager, and Mr Harwell from his former position of assistant product sales manager. Each of the five is responsible for certain groups of chemicals.

Merritt A Bigelow Jr, Philip G Magnusson, and **Lester D Polderman** were named assistant product sales managers. Mr Bigelow will assist Mr Russ, Mr Magnusson will assist Mr Boltz, and Mr Polderman will assist Mr Harwell.

Ames

Irwin Ames, formerly with Onyx Oil & Chemical Co, has been named a technical sales representative for Synthron, Inc, Ashton, RI.

Mr Ames will handle sales and service for Synthron in New York, New Jersey and Pennsylvania.

Aude

H M Brown

Kaplan

Robert M Aude is now vice president and general manager of the Heyden Chemical Division of Heyden Newport Chemical Corp.

Mr Aude began his association with the corporation in 1953 as manager successively, of the Fords and Garfield NJ plants. In 1956, he was named director of sales planning and coordination.

William B Woodall Jr has joined the sales staff of Arnold, Hoffman & Co, Inc. He will service the company's accounts in the Atlanta, Ga, area, filling the vacancy created by assignment of **John T Rose** as manager of the Arnold, Hoffman Charlotte sales office.

Mr Woodall formerly was employed by Reeves Brothers in the piece goods dyehouse of their Eagle & Phenix Division at Columbus, Ga.

The appointment of **I Heckenbleikner** as research director of Carlisle Chemical Works, Inc, Reading, O, and its division, Advance Solvents and Chemical, New Brunswick, NJ, has been announced.

Most recently, he was research director of Shea Chemical Corp and before that in the Stamford Research Laboratories of American Cyanamid.

At Carlisle, he will direct the research activities of products in the textile and other industries.

Hugh M Brown, physicist, of Clemson, SC, has been appointed textile consultant to The Sheffield Corporation, Dayton, O.

The company manufactures and markets Micronaire gages for measuring fineness of cotton fibers by means of controlled air, and an electronic yarn imperfection counter, the Neptel gage.

Dr Brown will assist in the development of new types of pneumatic and electronic gages and measurement standards for textile materials ranging from raw stock through finished product. He holds numerous patents for textile testing devices and machinery.

Until his retirement in 1957, Dr Brown served as head of the School of Textiles at Clemson College.

Henry M Morgan, assistant director of Fabric Research Laboratories, Inc, Dedham, Mass, has been named to the Committee on Personnel Armor of the National Academy of Sciences - National Research Council - Advisory Board on Quartermaster Research and Development.

The Committee on Personnel Armor is responsible for supplying scientific and technical advisory services to the Quartermaster Research and Engineering Command on the research and development of personnel armor made of textile, metallic, plastic, or ceramic materials or a combination thereof.

Stein, Hall & Co, Inc, has announced the promotion of **Paul Kaplan,** former manager of the Technical Division, to the position of technical director. He will be in charge of Stein Hall's technical facilities in the company's laboratories and Development Department in New York; the textile laboratories in Charlotte, NC, and Pawtucket, RI, and the plant laboratory in Charlotte.

Albert R Robbins was appointed manager of the Development Department with headquarters in the company's executive offices in New York and **Arthur M Goldstein,** former head of Stein Hall's Paper Laboratory, was made director of the company's New York Laboratories in Long Island City. Mr Robbins had served previously as manager of the New York Laboratories.

The Chemical Division of Armour and Company has realigned its sales organization into two distinct groups to handle fatty acids and aliphatic organic compounds.

Paul L Sheppard, recently appointed sales manager, and his staff will be responsible for fatty acid-industrial oil sales exclusively.

L M Miller is sales manager of aliphatic organic compounds. He will be assisted by three regional managers and their sales staffs, plus a group of industry specialists.

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